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EVALUATION REPORT. VOLUME 1: COMPENDIUM
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FBI Fingerprint Identification Automation Study: AIDS III Evaluation Report

Volume I: Compendium

November 15, 1980

Prepared for
U.S. Department of Justice
Federal Bureau of Investigation
Through an agreement with
National Aeronautics and Space Administration
by
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California



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16. Abstract <p>A feasibility study is being conducted by the Jet Propulsion Laboratory for the Federal Bureau of Investigation through an agreement with the National Aeronautics and Space Administration. This volume of the report, <u>Compendium</u>, encompasses the primary features of the overall study, titled FBI Fingerprint Automation Study, which provides an evaluation of an automation system proposed by the prime contractor, Rockwell International. Objectives of the study are described, methods of evaluation are summarized, and conclusions are reached in an Executive Summary presented as Section I. This volume also includes a brief history of fingerprint automation activities within the FBI, the organization of the FBI, a Bibliography of documents and records, a data dictionary, and a reference set of all of the transparencies presented throughout the study. Detailed information is available within the larger work comprising nine volumes which are also described in this volume.</p>			
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ABSTRACT

A feasibility study is being conducted by the Jet Propulsion Laboratory for the Federal Bureau of Investigation through an agreement with the National Aeronautics and Space Administration. This volume of the report, Compendium, encompasses the primary features of the overall study, titled FBI Fingerprint Automation Study, which provides an evaluation of an automation system proposed by the prime contractor, Rockwell International. Objectives of the study are described, methods of evaluation are summarized, and conclusions are reached in an Executive Summary presented as Section I. This volume also includes a brief history of fingerprint automation activities within the FBI, the organization of the FBI, a Bibliography of documents and records, a data dictionary, and a reference set of all of the transparencies presented throughout the study. Detailed information is available within the larger work comprising nine volumes which are also described in this volume.

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CONTENTS

I.	EXECUTIVE SUMMARY -----	1-1
A.	GENERAL -----	1-2
B.	ECONOMIC FEASIBILITY -----	1-4
C.	ENVIRONMENTAL ANALYSIS -----	1-5
D.	OPERATIONAL FEASIBILITY -----	1-7
E.	TECHNICAL FEASIBILITY -----	1-9
F.	TOP DOWN FUNCTIONAL ANALYSIS -----	1-9
G.	FUNCTIONAL REQUIREMENTS AND MEASURES OF EFFECTIVENESS -----	1-9
H.	INTERRELATIONSHIP OF VOLUMES -----	1-10
I.	CONCLUSIONS AND RECOMMENDATIONS -----	1-11
II.	AIDS III DESIGN GUIDELINES EVALUATION -----	2-1
III.	ORGANIZATION OF THE FBI -----	3-1
IV.	STATEMENT OF THE PROBLEM -----	4-1
V.	AUTOMATION PLAN OVERVIEW -----	5-1
	REFERENCES -----	6-1
	BIBLIOGRAPHY -----	7-1
	APPENDIXES	
A.	DATA DICTIONARY -----	A-1
B.	BRIEFING CHARTS -----	B-1
C.	ACRONYMS -----	C-1

Figures

1-1. Feasibility Comparison of AIDS III vs Current System -----	1-3
1-2. Annual Costs Base Case Scenario -----	1-6
1-3. Variation of AIDS III Life Cycle with Implementation Cost and Personnel Reduction -----	1-6
1-4. 1978 Per-Capita Submission of Fingerprint Cards (States Ranked by Population) -----	1-8
1-5. Relation of Drivers to Work Load Projection -----	1-8
1-6. Interrelationship of Volumes -----	1-11
2-1. Trade-Off Between Miss Rate and False Drop Rate -----	2-5
3-1. Organization of the FBI -----	3-2
3-2. Organization of the Identification Division -----	3-3
3-3. Organization of the Technical Services Division -----	3-3
5-1. Significant Dates--FBI Fingerprint Identification Automation -----	5-2
5-2. Manual Identification Process -----	5-4
5-3. Process with AIDS I -----	5-4
5-4. Process with AIDS II -----	5-5
5-5. Process with AIDS III -----	5-5

Tables

1-1. Measured Response Time (Calendar Days) -----	1-3
2-1. Evaluation of Guidelines -----	2-2
A-1. Data Dictionary -----	A-4

SECTION I
EXECUTIVE SUMMARY

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A feasibility study of the automation of fingerprint identification is being conducted by the Jet Propulsion Laboratory (JPL), California Institute of Technology, for the Federal Bureau of Investigation (FBI), U.S. Department of Justice, through an interagency agreement with National Aeronautics and Space Administration. This study, officially titled the FBI Fingerprint Automation Study, evaluates the prime contractor's (Rockwell International) proposed Automation of Identification Division System Model III (AIDS III).

The FBI's Identification Division maintains the United States national repository in the form of two fingerprint files, a criminal file and a civil file. It is the largest repository of this type in the world. The criminal file contains 77 million cards bearing the fingerprints of 22 million persons. The civil file contains 93 million cards with the fingerprints of 42 million persons. To identify a person positively, two sets of fingerprints are matched against each other. Until now this fingerprint identification process has been mostly manually operated.

The Identification Division receives an average of 44,000 pieces of mail for processing each day in the form of fingerprint cards, criminal inquiries, and requests for clearance for sensitive job applications. Normal processing of criminal and civil cards takes an average of 50 calendar days* using the manual system. Sixty million dollars per year was budgeted and \$56 million was spent in FY79 for this operation. The 30% annual personnel turnover prevents staffing to the 3409 authorized complement (in December 1979).

The backlog of the present system's work load as of May 1980 is growing. The system, as presently staffed, may not be able to meet the needs of the user agencies and improvement of this system has become imperative. These conditions have prompted an effort to improve cost efficiency and system performance; the automated system is being considered as part of that effort.

The two major objectives of this study are: (1) to determine the technical, economic, and operational feasibility of the proposed automation of the identification process, the subject of this report, and (2) to devise and develop, in detail, alternative systems, both largely manual and fully automated systems, and rank them against the proposed automation system, the subject of a final report due in March 1981.

*36 working days, based on measurements made by JPL in December 1979 and May 1980 of fingerprint cards which received full identification processing (i.e., illegibles and other rejected cards were not included).

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A. GENERAL

As stated, the major subject of this report is the technical, operational, and economic feasibility of the May 1980 AIDS III system. All three criteria of the feasibility study must be satisfied simultaneously. Figure 1-1 graphically contrasts AIDS III and the current system. Technical, operational, and economic feasibility are characterized by a single parameter and plotted on one of the three axes. The economic feasibility is characterized by the cost of a fingerprint search, operational feasibility is characterized by response time, and technical feasibility by the relative maturity of the technologies employed.

Evaluation of the tangible benefits of AIDS III (Volume IV) shows that the AIDS III mail room to mail room response time will be better than that of the present system with the present configuration and staffing level (3100 actual operating personnel in FY-79). To make the current system feasible and bring the internal processing time to 24 hours*, would require a staff of 3700 persons. AIDS III can perform the same tasks in three hours (except for the eight-hour delays through the manual system for 20% of the 1993 work load) with a 30% personnel reduction in the operational staff. The cost per fingerprint (technical) search will drop from \$7.76 to \$3.67**. The cost per transaction would be reduced from \$5.45 to \$4.35. The miss rate in fingerprint search will decrease from 24% to 5% (Volume III).

These figures imply that significant tangible benefits could result from automating the Identification Division system.

There are design uncertainties, that include difficulties in the automated image retrieval for verification, data base management, card transport, and the AIDS III-to-manual system interface.

Operational problems of the system include the inability of AIDS III to handle the design work load because of its marginal production capacity, disruption that would be caused during the transition, and the inability of the system to respond to changes in work load volume and mix.

The implications of these findings are:

- (1) The present system is not feasible: long response time is growing (see Table 1-1).

*Mail room to mail room response time of 2 working days.

**Figure 1-1 shows the cost per fingerprint search as \$8.26 for the current system staffed at 3700 persons. \$7.76 is the current cost per search.

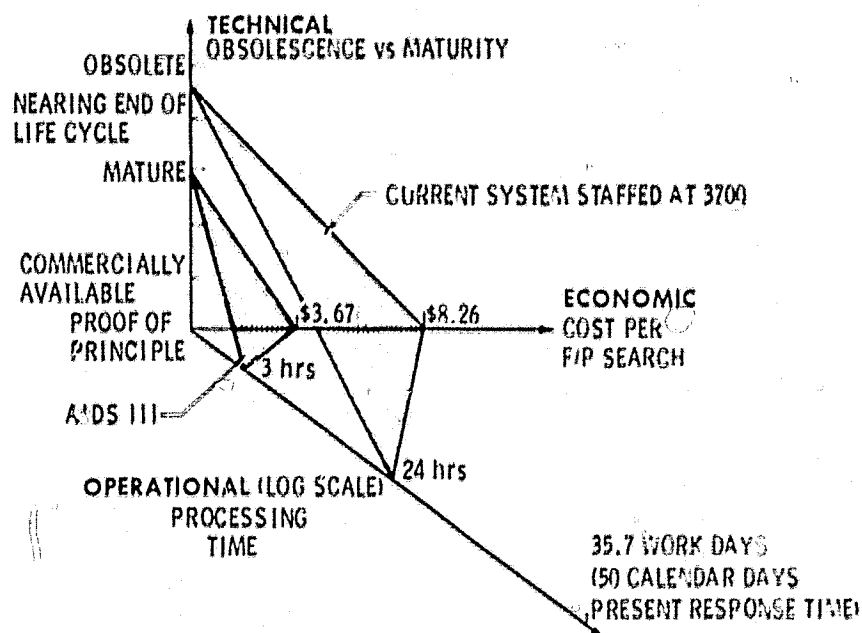


Figure 1-1. Feasibility Comparison of AIDS III vs Current System

Table 1-1. Measured Response Time (Calendar Days)

	Criminal		Applicant		Average Overall (Weighted by Volume)
	Ident	Non-Ident	Ident	Non-Ident	
Dec. 17, 1979					
Sample Size	44	32	97	Not Measured	
Average	49.0	51.8	33.9		50.1*
Std. Dev.	23.3	6.5	18.3		
May 7, 1980					
Sample Size	136	200	200	200	
Average	71.9	54.7	63.0	24.6	46.43**
Std. Dev.	28.6	12.2	25.3	5.0	
Median	68	51	55	22	

*Criminal Only

**65.2 Criminal Alone

- (2) If design problems are not solved the automation benefits will not be achieved. AIDS III may not be as cost-effective as estimated; e.g., the life-cycle costs of AIDS III may exceed the life-cycle costs of the current system.
- (3) Automated image retrieval may not work efficiently, and the response times may suffer.

This report recommends that short term and long term solutions to the present situation should be sought.

Short term solutions include:

- (1) Seek methods to reduce personnel turn over.
- (2) Investigate and implement helpful changes to the manual system and AIDS II (the automated name search portion of the current system). JPL is developing organizational and procedural change recommendations for the current system.
- (3) Investigate converting more of the manually operated card index to expand the automated name search capability of AIDS II.

Long term solutions are:

- (1) Proceed with automation planning and development.
- (2) Continue with the second phase of the JPL study.
 - (a) Alternatives to the current system and AIDS III will be developed.
 - (b) All candidates will be analyzed and ranked.
- (3) Incorporation of high ranking candidate system(s) in pursuing a combination of short and long term solutions may be the most cost and operationally effective.

B. ECONOMIC FEASIBILITY

The economic feasibility of the AIDS III is discussed in Volume IV. AIDS III is evaluated for a set of economic feasibility measurements of life-cycle costs, implementation costs, annual operating expenditures, annual capital expenditures, and cost/benefit data. The economic feasibility is determined by comparing the evaluated measurement with the same measurements for the current system.

The economic feasibility issues of AIDS III have been studied to determine:

- (1) If the life-cycle cost (1980-2004) of AIDS III is less than the life-cycle cost of the present system under a variety of future system work loads.

- (2) If the estimated annual personnel cost savings are sufficient to justify AIDS III implementation cost.
- (3) If the predicted improved performance of AIDS III over the present system justifies the AIDS III implementation costs.
- (4) The planned annual expenditures.
- (5) Which of the many uncertainties in the future economic and operational environment have a significant effect on the AIDS III cost estimates and the cost comparisons between AIDS III and the current system.

The study determined that AIDS III will achieve the cost savings necessary to offset the \$50,591,000 implementation costs, if the system is implemented on schedule. The life cycle cost of AIDS III is \$553,600,000 compared with \$573,500,000 for the present system. A 10% discounted savings of \$19,900,000 will be realized over the 25-year evaluation period and thus tangible benefits could result from automation of the Identification Division system. Figure 1-2 shows the planned annual expenditures of the AIDS III system.

The economic benefits of AIDS III are sensitive to uncertainties in cost. Figure 1-3 shows the effect on the life cycle of uncertainties in implementation costs and savings due to personnel reductions. If the estimates fall in the unfavorable corner of the +25% uncertainty rectangle, then the life-cycle cost of the AIDS III could be greater than that of the current system. The +25% uncertainty rectangle shown in Figure 1-3 is based on the Rockwell evaluation of their cost estimate uncertainties.

C. ENVIRONMENTAL ANALYSIS

The objectives of the environmental analysis were to determine the existing and future political, economic, legislative, and social trends that might affect the work load of the Identification Division. The development of scenarios helped to characterize the relationship of these drivers of potential change to the work load. External and internal models of the environment were used. The internal model characterizes the environment from the Identification Division's point of view. The external model takes into account points of view of agencies who are contributors of work and often are competitors who perform the same functions. This second model investigates the loci and methods of control of other agencies. The results of this study are seen in Volume VI of this report.

The environment of the Identification Division is complex. The control of the work load may be exercised by external agencies such as state and local officials. These external controls are not centrally located, and they are not used in unison to change the work load.

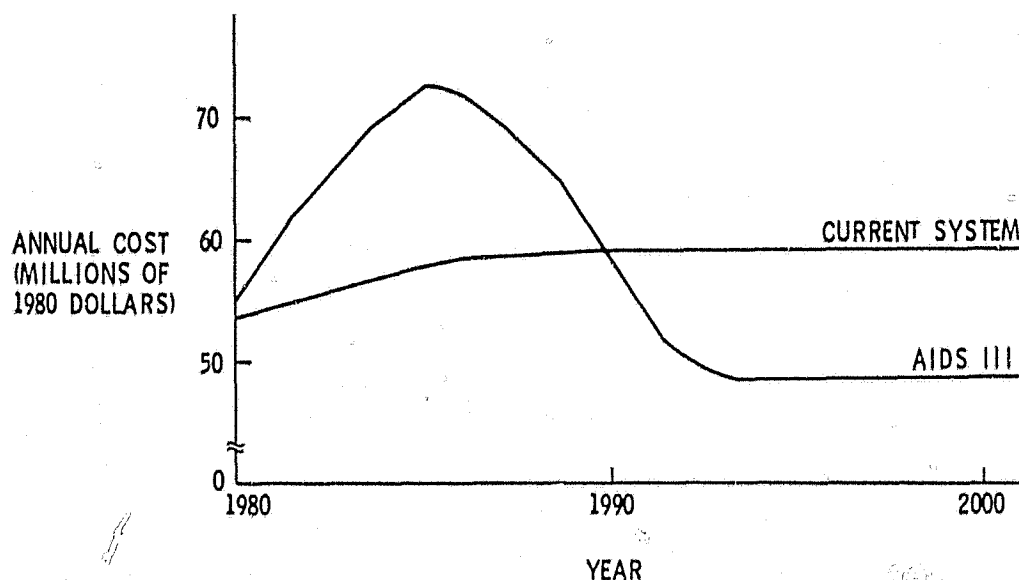
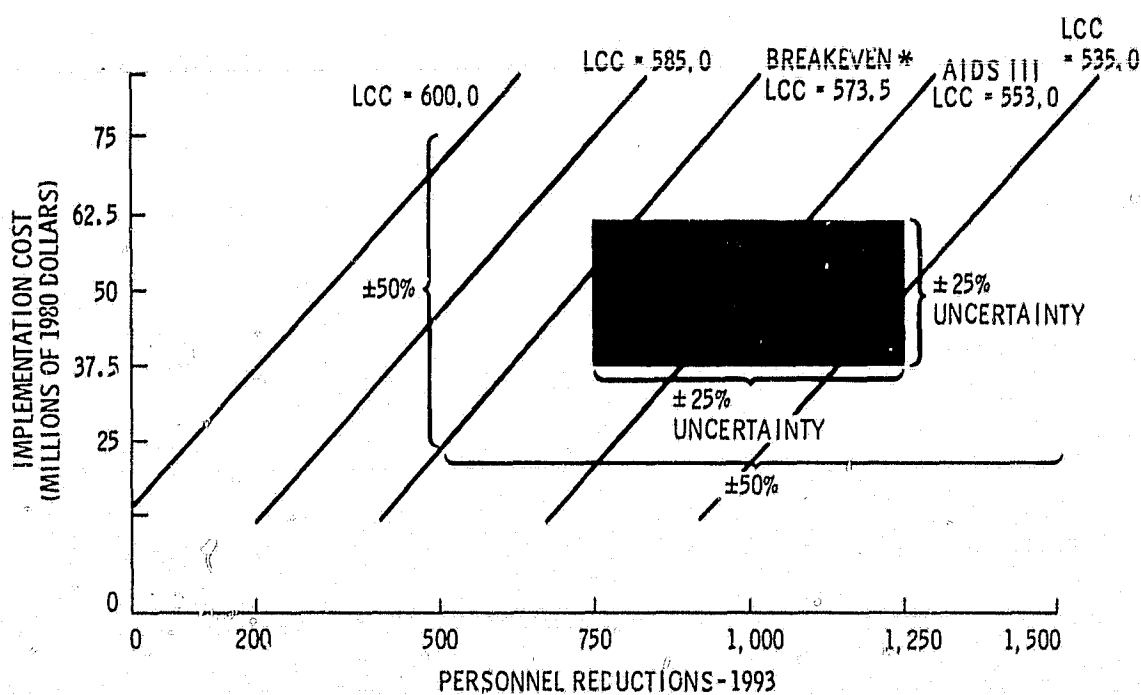


Figure 1-2. Annual Costs Base Case Scenario



* The Life Cycle Cost of the Current System is estimated to be \$573.5M

Figure 1-3. Variation of AIDS III Life Cycle With Implementation Cost and Personnel Reduction

There are two methods to determine user requirements, categorization and sampling in each category or a complete survey of all users. There is no known grouping of Identification Division users that would allow for sampling. For example, the per-capita submissions do not correlate with the population density of the states. Figure 1-4 shows the per-capita submission of criminal fingerprint cards for the 50 states and the District of Columbia. The states are ordered by population to show that high as well as low per-capita submissions can be found for states of all population ranges. A complete survey of the 50 states and the federal government agencies is suggested to determine the user requirements.

In projecting the future work load of the Identification Division with the internal model, it was determined that there would be very little change from 1993 work load specified in the Identification Divisions AIDS III Design guidelines. The guidelines also specify a 50% boundary above this 1993 work load. The external model indicates one possibility of an increase in the work load beyond the 50% boundary but this is near the end of the life cycle of the system (Figure 1-5). However, any significant increase in the work load will saturate the AIDS III system. This saturation will require an addition of processing capability or overtime. The recommendation of the study is that the work load capacity of the system be increased to make it capable of handling surges. Also, design guidelines that require systems designers to keep work station utilization below a specified value for nominal work load should be developed.

D. OPERATIONAL FEASIBILITY

Operational Feasibility, Volume III of this report, addresses whether the system design of AIDS III meets the functional and performance requirements of the FBI and if the required hardware and software are available, mutually compatible, and adequate.

The analysis of AIDS III indicates that all components of the various functions are feasible if the technical developments are successful. Analysis also indicates that the system is sensitive to surges in volume, and has a very low tolerance for equipment failure. If a single unit fails, the work load on other units will increase and many of the functions could not handle it. As a consequence, response time will increase or overtime will be necessary. To make the system operationally feasible, the JPL study had to add five work stations to the Rockwell concept.

Analysis of individual components indicates that AIDS III is sensitive to subsystem availability. The operational feasibility of AIDS III is marginal and if the subsystem availability falls below 93% in three specific cases, the system will saturate, queues will grow, and overtime will be necessary to maintain the required response time. Re-evaluation of the system configuration and its architecture is recommended to eliminate these potential problems.

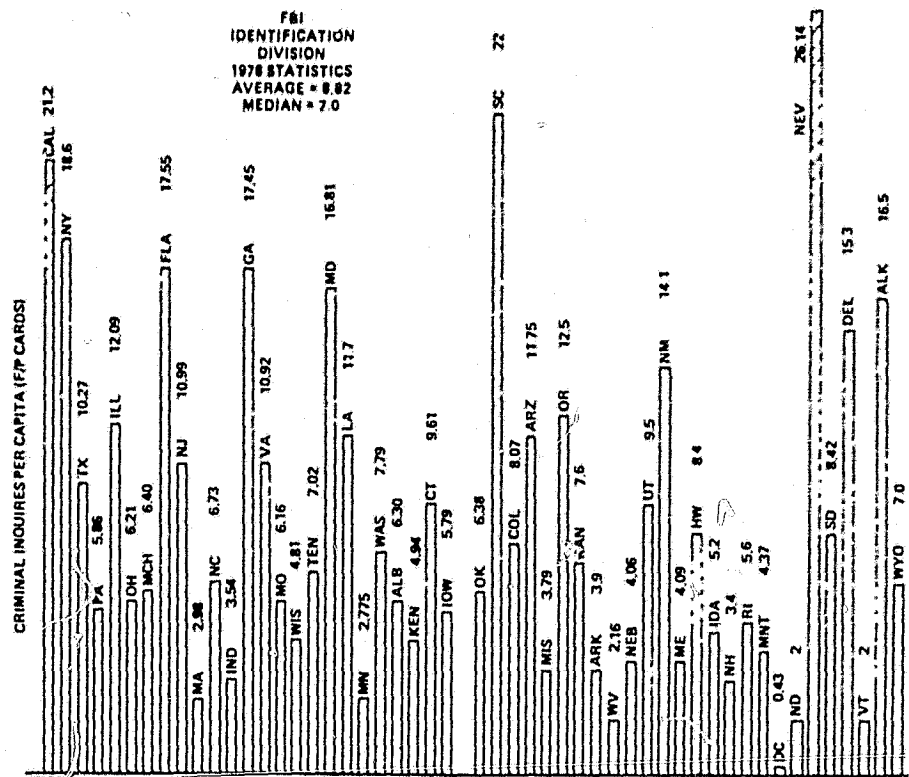


Figure 1-4. 1978 Per-Capita Submission of Fingerprint Cards
(States Ranked by Population)

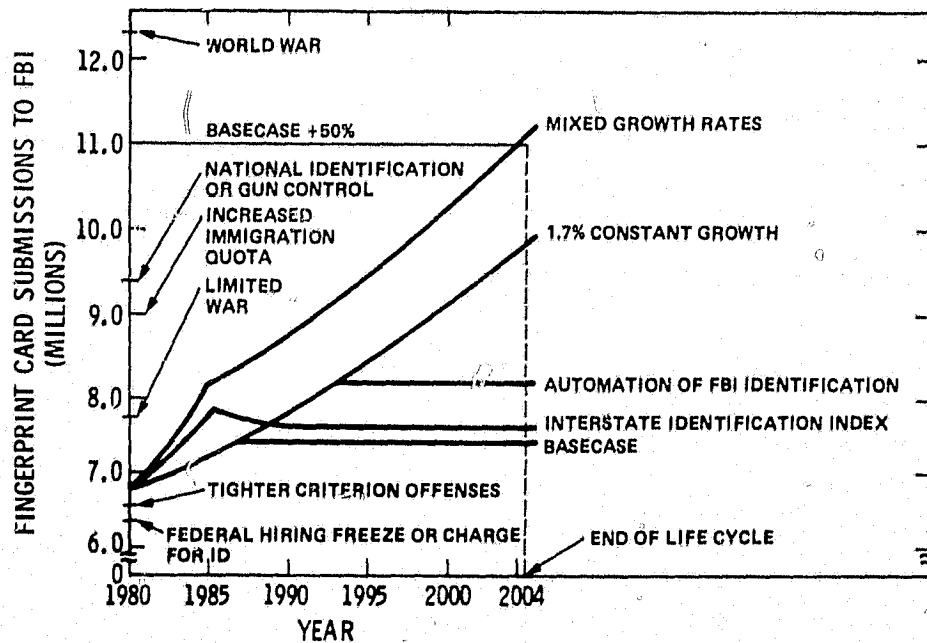


Figure 1-5. Relation of Drivers to Work Load Projection

E. TECHNICAL FEASIBILITY

The purpose of the Technical Feasibility study (Volume II) is to survey current applicable technology, assess technical feasibility of the technology, project trends, compare competing technologies, assess the risk involved in committing to the technical approaches selected, and determine whether the technologies used will be obsolete and no longer cost-effective by the operational date.

The Technical Feasibility study concluded that the technologies needed to implement AIDS III are well established. However, the design specified by Rockwell International is deficient in the areas of process control, automated image retrieval, and data base management. These deficiencies jeopardize the operational and economic feasibility of AIDS III. It is recommended that the deficiencies in the design be corrected in these areas before committing to implementation.

F. TOP DOWN FUNCTIONAL ANALYSIS

The Top Down Functional Analysis was completed as a first, basic step in supplying the JPL team with a hierarchical functional description and an identification of those functions that are candidates for automation. The results of the TDFA are found in Volume VII of this report. Major findings indicated that not all functions that are candidates for automation are being automated by AIDS III; specifically 49 of the possible 58. For example, fingerprint classification, work load balancing, fingerprint card centerline determination, etc., are not being automated by AIDS III. The implications of this finding are that the potential advantages of automating the system may not be fully realized, and that the automated system may not be as cost-effective as some different approach.

It is recommended that an overall automation plan be developed for automating AIDS III. This plan should determine the priority and order in which functions are selected for automation. The plan should be re-examined as technology evolves and causes changes in the economic environment.

G. FUNCTIONAL REQUIREMENTS AND MEASURES OF EFFECTIVENESS

Functional requirements are the collection of the capabilities that a system and its subsystems must possess to fulfill the objectives of the system. Volume IX, Functional Requirements, states the functional, performance, and general requirements for the FBI Fingerprint Identification system, and has been used in evaluating the AIDS III system concept and will be used for evaluation of the alternative systems that will be studied in the second phase of this work.

Measures of Effectiveness (Volume VIII) provides quantitative and qualitative evaluation criteria and states the parameters used to assess the performance of a system in attempting to achieve its goals.

The combined major findings of these two volumes indicate that there are performance requirements that are either missing or unsubstantiated. For example, the Identification Division guidelines response time is not based on user requirements. Also, the system performance is not specified in terms of allowable miss rate. The implications of these findings indicate that functional and performance requirements could not be used as operational feasibility criteria. Sensitivity testing was employed as an operational and economic feasibility metric. This report recommends that performance requirements be developed based on federal and local government needs.

H. INTERRELATIONSHIP OF VOLUMES

Nine volumes support this automation study: Compendium (Volume I), Technical Feasibility (Volume II), Operational Feasibility (Volume III), Economic Feasibility (Volume IV), Current System Evaluation (Volume V), Environmental Analysis (Volume VI), Top Down Functional Analysis (TDFA, Volume VII), Measures of Effectiveness (Volume VIII), and Functional Requirements (Volume IX).

Figure 1-6 shows the interrelationship of these nine volumes. The evaluation of AIDS III started with the TDFA. This document provided a hierarchical description of the identification functions and is the basis for the other analysis. The Environmental Analysis study determined the external forces and their influence on the work load functions performed by the Identification Division. The current System Evaluation studied the internal working of the system and collected data on the history of work load volume and composition. The Measures of Effectiveness provided quantitative and qualitative evaluation criteria for assessing the system. The functional and performance requirements of AIDS III were developed on the basis of information gained in these early analyses.

The functional and performance data that appear in Volume IX are used as a basis for assessing technical and operational feasibility. Technical feasibility analysis supports the operational feasibility study by supplying technology evaluation and projections of the cost of new technology for the economic feasibility analysis. Operational feasibility provides information on AIDS III performance or benefits for economic assessment.

Current System Evaluation supplies the cost and benefit data of the current system to support economic feasibility analysis. Environmental Analysis gives work load projections based on scenarios representative of the external environment to support the economic feasibility analysis. These scenarios are then used in sensitivity tests of AIDS III. This sensitivity testing and cost estimation of AIDS III system performance was required because of the uncertainties in technical issues and cost estimates.

I. CONCLUSIONS AND RECOMMENDATIONS

The present system performance is not feasible because it takes the Identification Division 50 calendar days to respond to inquiries, there is a turnover in personnel of 30% per year, and it costs \$56 million to \$60 million a year to operate in the current mode. The AIDS III system provides performance and cost benefits only if the cost estimates are on target, technical problems are solved, and the operating margins are improved. The automation of the Identification Division and the improvement of the semi-automated system should be investigated further to find the most cost-effective solution that will meet user requirements. The continuation of the second phase of the JPL study is recommended.

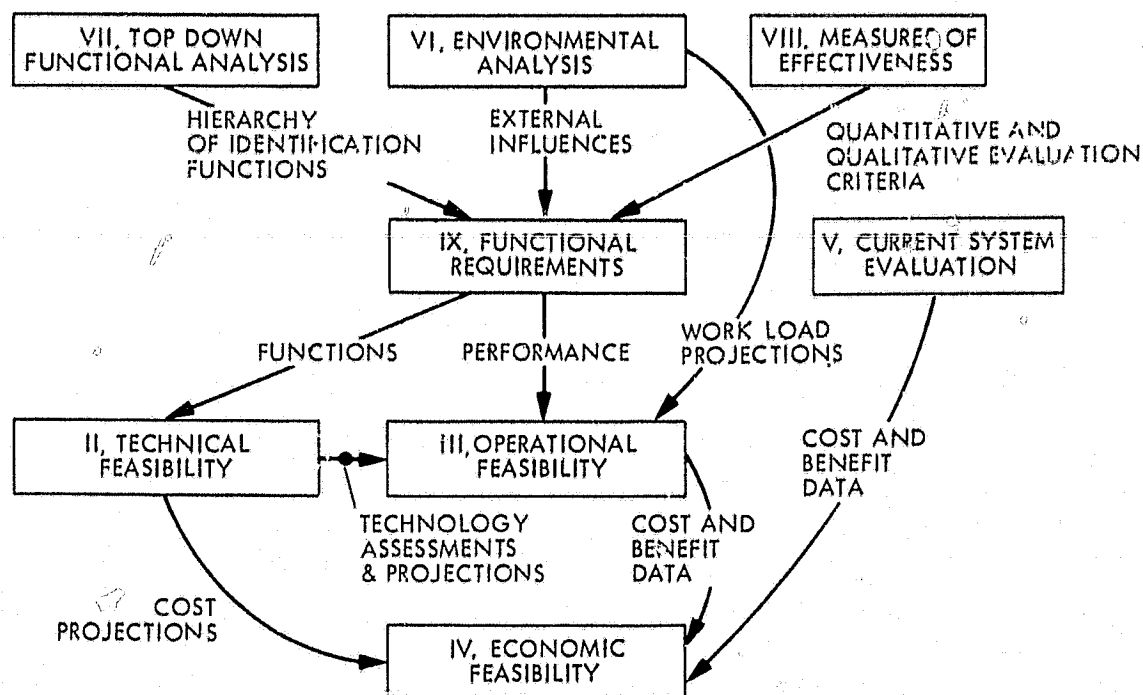


Figure 1-6. Interrelationship of Volumes

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SECTION II

AIDS III DESIGN GUIDELINES EVALUATION

The design guidelines (Reference 1) published by the Identification Division to the contractor developing the AIDS III concept are a source of performance and functional requirements, constraints, objectives and instructions to the system developers. These guidelines are evaluated and discussed in Volume III, Operational Feasibility. Table 2-1 provides an assessment of the capability of AIDS III to meet these guidelines. The guidelines have been paraphrased for brevity.

Achievement of Guideline #7 (Minimize overtime) will be determined when the system is operational. However, due to the small reserve production capacity of AIDS III, pulses or surges in work load will exceed system capability and overtime will be required or response time will suffer.

Achievement of Guideline #2 (Semi-automatic classification not to preclude automatic classification) remains to be determined because the automatic classification technique using the Henry Fingerprint Classification System in a file of 22 million subjects is under development. There is nothing in the semi-automatic technique which precludes automatic classification, but the existence of a solution for automatic classification is not proven. The system design and data base management of the automated identification system might be better served by using a different classification scheme not based on the Henry system which is inherently poor. Of the 1024 major Henry classification categories, approximately one quarter of the population fall into one class, thus making the distribution of classes extremely non-uniform.

Achievement of Guideline #11 (Automated Technical Search (ATS) performance equal to or better than the M-41 Matcher) addresses part of the requirement for search performance. There is a trade-off between the probability of missing an individual in the file (miss rate) and the average number of candidates that result from a search (false drop rate). As the false drop rate is reduced, the miss rate tends to increase and vice versa. Figure 2-1 illustrates this.

It is recommended that tests be conducted to determine the false drop rate versus miss rate curve for the ATS. Having determined this relationship, the optimum operating point can be found. Without this analysis, the system may be operating at a point with an unnecessarily high miss rate.

Table 2-1. Evaluation of Guidelines*

Guideline Reference Number*	Design Guideline	AIDS III Evaluation
1a	Achieve cost savings	Yes**
1b	Improve quality of service	Yes***
7	Minimize overtime	To be determined (see text)
10	Hardware procurements not be based upon suggested configuration during evaluation phase.	Yes
1f	Non-disruptive implementation	Yes
1h	Parallel running of automated and manual systems to allow for file conversion	Yes
2	Semiautomatic classification system not to preclude future automatic system	To be determined (see text)
3	Manual fingerprint card retrieval system acceptable	Manual until auto- matic retrieval implemented
12	Three-byte minutiae storage and matching	Yes
13	Five Automatic Fingerprint Reader Systems (AFRS)	Yes
14	System based upon available technology	Yes****
16	Modular design for workload variations	Yes***

* Identification Division in AIDS III Design Guidelines, (Reference 1)

** See Volume IV, Economic Feasibility

*** See Volume III, Operational Feasibility

**** See Volume II, Technical Feasibility

Table 2-1. Evaluation of Guidelines* (Continuation)

Guideline Reference Number*	Design Guideline	AIDS III Evaluation
1j	Remain within current Identification Division space allocation	To be determined, space requirements not consistent between Jan 80 and May 80 System descriptions.
1j	Fingerprint card to remain unchanged	Yes
5	Workday to be 18 hrs/day, 5 days/week for routine processing; 24 hrs/day, 7 day/week for expedite processing	Yes***
6	Staffing to be at a ratio of 2 to 1 day shift to night shift.	Yes***
1d	Preserve or improve the integrity, security of data	To be determined****
1c	Preserve existing legal and accountability features	Yes
1g	Subsystems to be tested separately before large scale implementation	Yes
1k	Supportive of National Crime Information Center Computerized Criminal History (CCH) program	Yes
1l	Not to preclude latent fingerprint search	To be determined but probably only limited latent capability
1m	Not to preclude alternative methods for data transmission between origin and Identification Division	Yes

* Identification Division in AIDS III Design Guidelines, (Reference 1)

** See Volume IV, Economic Feasibility

*** See Volume III, Operational Feasibility

**** See Volume II, Technical Feasibility

Table 2-1. Evaluation of Guidelines* (Continuation)

Guideline Reference Number*	Design Guideline	AIDS III Evaluation
1c	Improve fingerprint identification accuracy relative to current system	Yes, based on pilot project results (ATSPS)***
4	Automated Subject Search to handle 14.5 million records; Automated Fingerprint Search to handle 14-26 million records	Yes
8	Workload to be 1973 actuals plus 25%, (29,200 fingerprint cards per day)	Yes
9	Response time to be: 0.95 probable for 8 hrs/30 min, 0.99 probable for 48 hrs/8 hrs, 0.999 probable for 96 hrs	Yes, with minor additions to system capacity based on JPL results***
11	Automated Technical Search (ATS) - based on minutiae and equal to or better than M-41 Matcher performance	M-41 Matcher to be used (see text)
15	ATS CPU requirements (8 sec/search)	To be determined, but probably true
	AFRS cards read/hour (210)	Yes, with planned firmware enhancement
	AFRS system availability (95%)	98% from FBI logs***

* Identification Division in AIDS III Design Guidelines, (Reference 1)

** See Volume IV, Economic Feasibility

*** See Volume III, Operational Feasibility

**** See Volume II, Technical Feasibility

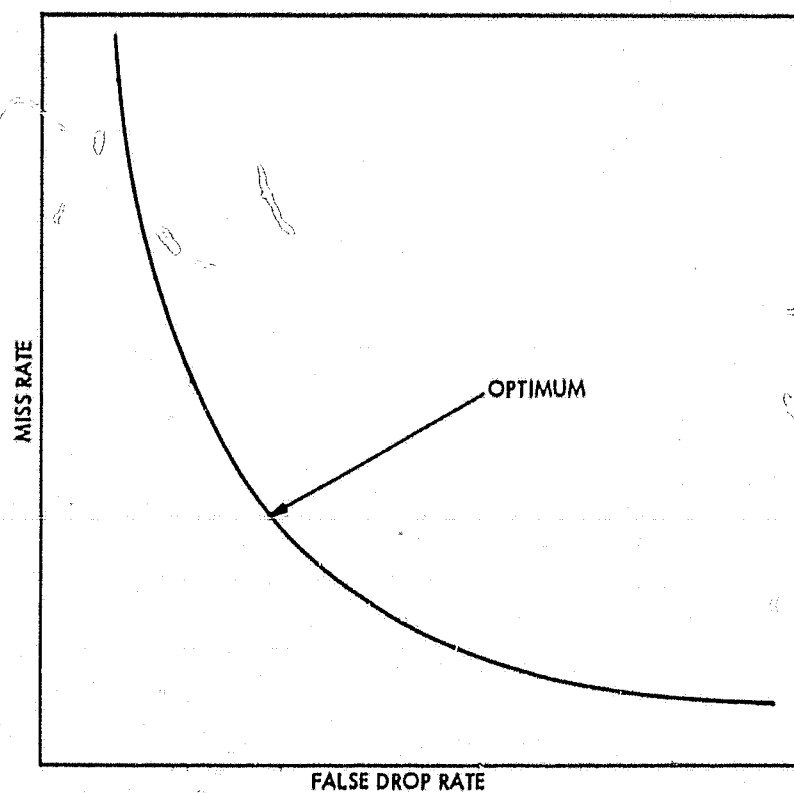


Figure 2-1. Trade-off Between Miss Rate and False Drop Rate

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SECTION III

ORGANIZATION OF THE FBI

The overall organization of the FBI that has been in effect since August 1979 is represented in Figure 3-1. William H. Webster is the present director of the FBI. The three executive assistant directors head functional groups that are subdivided into divisions. This study is concerned with the automation of the identification process within the Identification Division, shown at the lower left corner of Figure 3-1. The Technical Services Division (at the lower right corner) who is sponsoring this study, is responsible for the procurement of technical equipment and for the implementation of the communications and computer systems.

The organization of the Identification Division is shown in Figure 3-2. The sections can be related to a work breakdown of the manual identification process as follows:

- (1) Recording: Initial sorting of input mail.
- (2) Card Index: Name search.
- (3) Technical: Fingerprint search, fingerprint identification, verification of identification.
- (4) Assembly: Creation and maintenance of criminal history records.
- (5) Latent Fingerprint: Identification of latent prints.
- (6) Posting: Special processing for fugitives.
- (7) Fingerprint Correspondence: Preparation of response to contributors.

An exception to the manual system work breakdown exists in the Automation and Research Section, which has been studying methods for automating the identification process for several years. This section is also responsible for the automated portions of the identification process.

The Technical Services Division is depicted in Figure 3-3. This division has sponsored the study to meet the objectives listed in the previous section. This study specifically is managed by the Office of Information Systems -- Research and Development.

The FBI is responsible for the operation of the National Crime Information Center (NCIC), a section of the Technical Services Division that includes the Computerized Criminal History (CCH) unit. The NCIC and the CCH have been operated as a computerized data base system for some years and, although their operations are not part of the study, they are a major interface to the automated identification system.

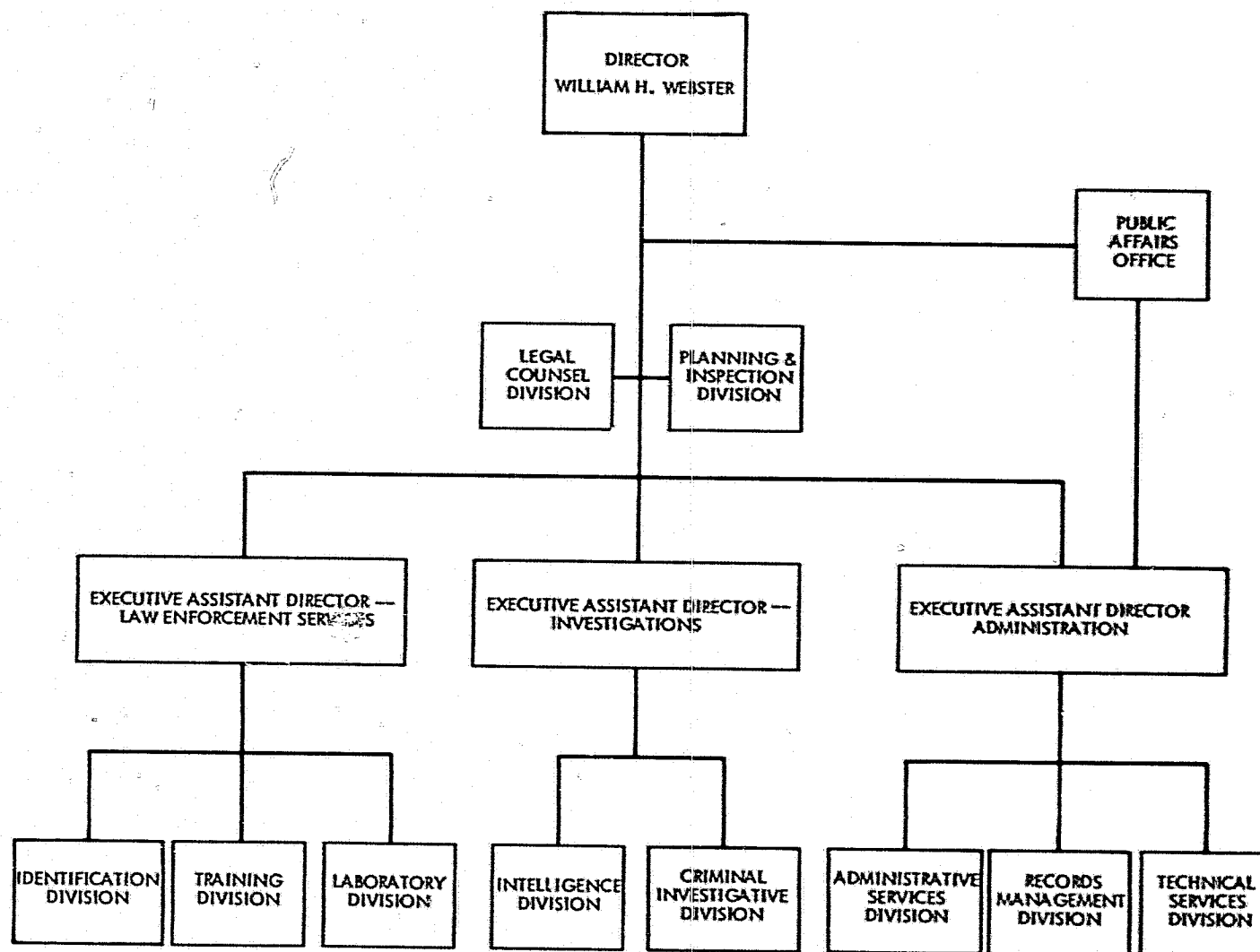


Figure 3-1. Organization of the FBI

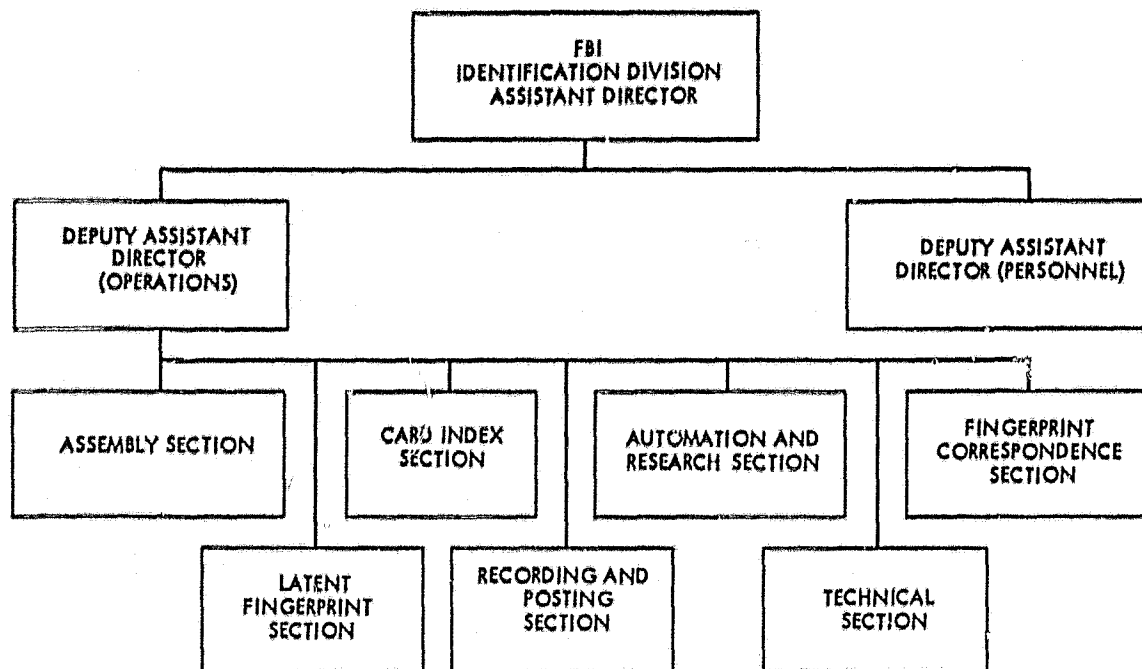


Figure 3-2. Organization of the Identification Division

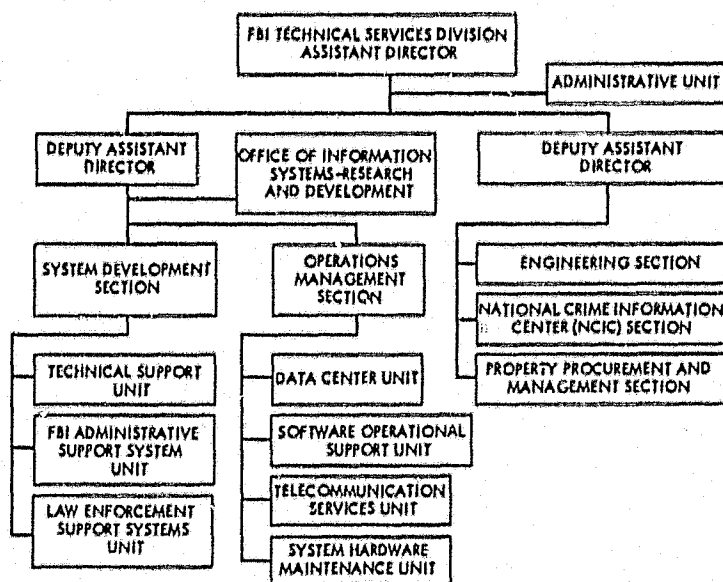


Figure 3-3. Organization of the Technical Services Division

SECTION IV

STATEMENT OF THE PROBLEM

The outmoded system within the Identification Division that calls for automation as a solution can be summarized by listing the characteristics of the present, primarily manually operated, identification process. Identification is established by matching two sets of fingerprints because this is considered the only positive and unique way to identify individuals. There is a possibility in the future of other techniques such as voice prints; however, this is not part of the study.

The FBI maintains two fingerprint files: the criminal file stored in the J. Edgar Hoover FBI Building in downtown Washington, D.C., and the civil file stored in the Harkins Building at Buzzard Point, Washington, D.C. The criminal file contains approximately 77 million fingerprint cards representing 22 million persons. An additional file of 14.5 million criminal history records is maintained on persons who have been charged with more than one crime. See Volume V, Current System Evaluation, for further details.

In the civil file, there are 93 million fingerprint cards representing 42 million persons. The civil file is not planned for automation since it is only rarely accessed, chiefly to identify disaster victims, amnesia victims, etc.

The criminal file is heavily used to identify persons charged with crimes, to determine prior criminal activity, and to verify that applicants for sensitive jobs do not have criminal records. Each day, the FBI Identification Division receives approximately 44,000 pieces of mail. These include 25,000 fingerprint cards -- 12,000 criminal inquiries and 13,000 applications for sensitive jobs. An additional 19,000 pieces of miscellaneous correspondence complete the 44,000 total. In the case of suspected fugitives, the FBI usually receives the fingerprint card via facsimile transmission from the arresting agency. These searches can be conducted and reply made usually within a matter of hours. For normal processing of criminal and civil cards, the U.S. mail is used to transmit the correspondence to and from the Identification Division. (See Volume V, Current System Evaluation.)

In addition to searching the file for a prior record, a few agencies can request the FBI to retain the fingerprint card in order to add it to an existing file or to create a new file for a new criminal suspect. In recent years the FBI has agreed to retain the cards of only those persons charged with serious crimes. The distinction between serious and non-serious crime is made by staff lawyers.

The FBI regularly corresponds with 29,000 users who provide information; it also accepts cards for storage from 9600 contributors. The user community includes criminal justice agencies, federal, state, and local governmental agencies, and institutions such as banks and employment licensing organizations. There are also international exchange agreements with 80 foreign governments.

SECTION V

AUTOMATION PLAN OVERVIEW

For years the FBI has been developing an automation plan leading to AIDS. The history of automation in the Identification Division starts in 1934 with experiments with punch card equipment, specifically, card sorters. This effort was somewhat successful but eventually the size of the file grew too large to continue to use card sorters for data processing.

Figure 5-1 depicts the sequence of events from 1970 to the present which relate to the automation effort in the Identification Division. This figure also shows the plan for future automation through the implementation of AIDS III. The figure plan is based on Reference 2 which indicates the planned transition from AIDS II to AIDS III. It should be noted that:

- (1) In 1967 research on fingerprint reading by computers was initiated. This led in 1968-69 to experiments with reading fingerprints and matching algorithms; demonstrations were performed at this time.
- (2) In 1971 a systems requirement study was performed by what is now Rockwell International corporation in cooperation with the Identification Division.
- (3) In 1972 a prototype computer capable of reading fingerprints was delivered. This system was called FINDER.
- (4) In 1973 the first version of the AIDS began operations. This led in 1974 to automating the criminal records of all first offenders and the collection of a data base for AIDS began. In 1976-77 five Automatic Fingerprint Reader Systems (AFRS) were delivered to increase the capability for fingerprint reading automation. The conversion of criminal fingerprint files began in 1977.

Figures 5-2 through 5-5 show the steps from a manual identification system to AIDS III. In all cases the simplified flow diagram shows the major functions performed. The first step is a name search to see if a record already exists in a criminal file for the fingerprint card submitted. If this search is successful and a match is made, then the fingerprint card is extracted from the file. It is compared with the submitted fingerprint card (the search card) to assure identification since name and birthdate are not sufficient. The fingerprint identification is verified by a second person who is senior to the person who performed the identification. The results of the identification are transmitted via the correspondence section to the contributor. In the AIDS I design the generation of the response also causes the criminal record to be entered in the automated data base.

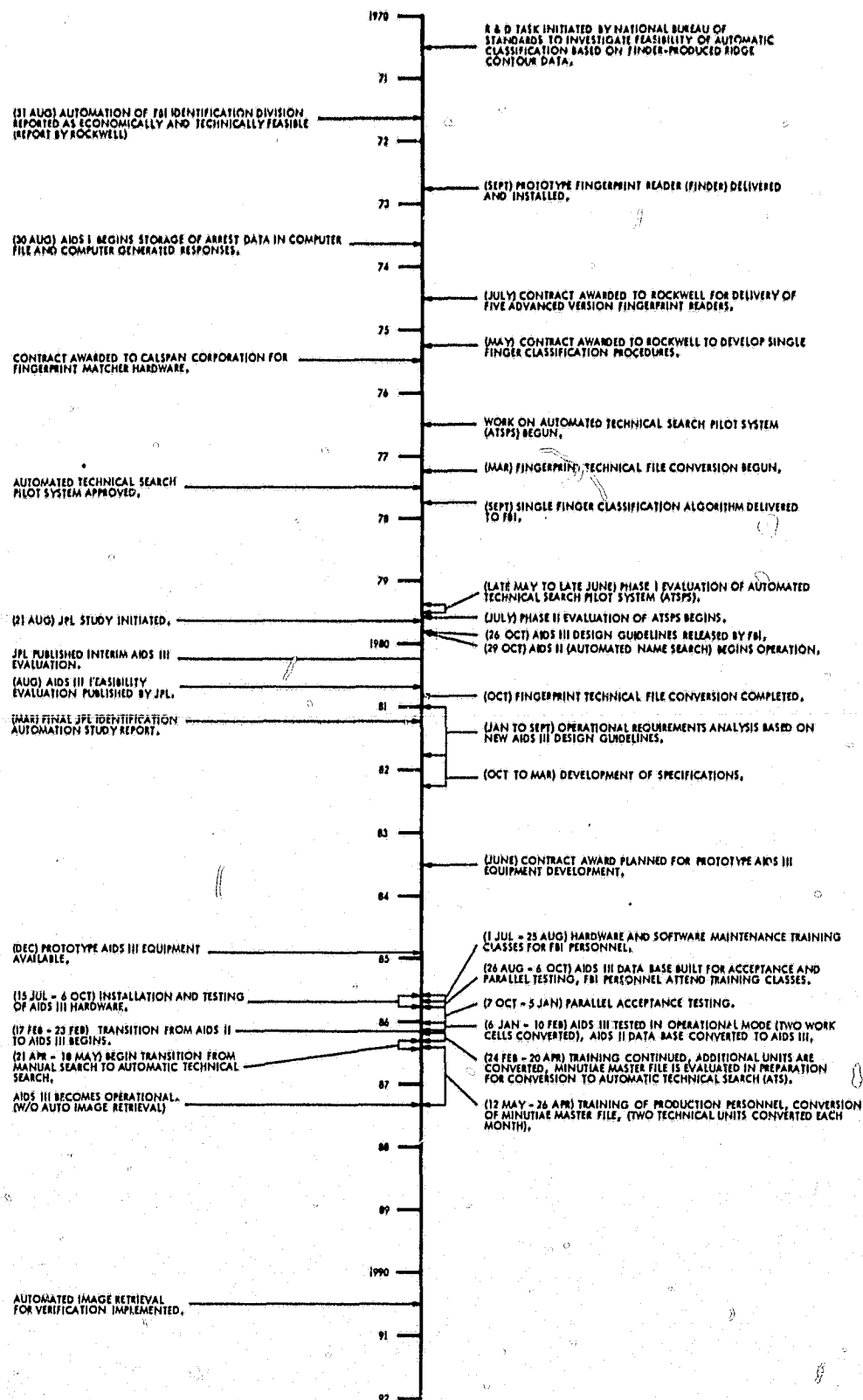


Figure 5-1. Significant Dates -- FBI Fingerprint Identification Automation

As shown in the AIDS II diagram, the name search function has been automated as has the correspondence function. Finally, in AIDS III the name search, fingerprint search, and correspondence functions will all be performed by the computer.

In the event the name search fails to find the individual, a fingerprint search is performed. The fingerprint search begins with classifying the fingerprints so that only one portion of the file must be searched. If a match is made, the identification is verified by a second party, as in the case of a successful name search, and correspondence is generated for the contributor. If both the name and the fingerprint search fail to find a candidate, the contributor is informed that the individual does not have a record in the FBI criminal file. If the fingerprint card is connected with a serious charge, the FBI will establish a file for the individual and store the submitted fingerprint card in the file, if the law enforcement agency submitting the card so requests. This makes the information available to any other contributing law enforcement agency.

If a suspected criminal has a prior arrest record, an arrest record file is updated. It contains a "rap" sheet and all but the best fingerprint card for that individual. The best fingerprint card is designated the master and is kept in the master fingerprint file.

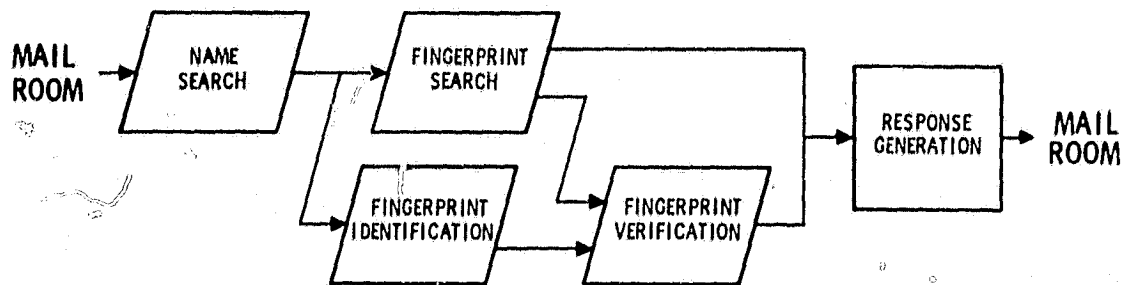


Figure 5-2. Manual Identification Process

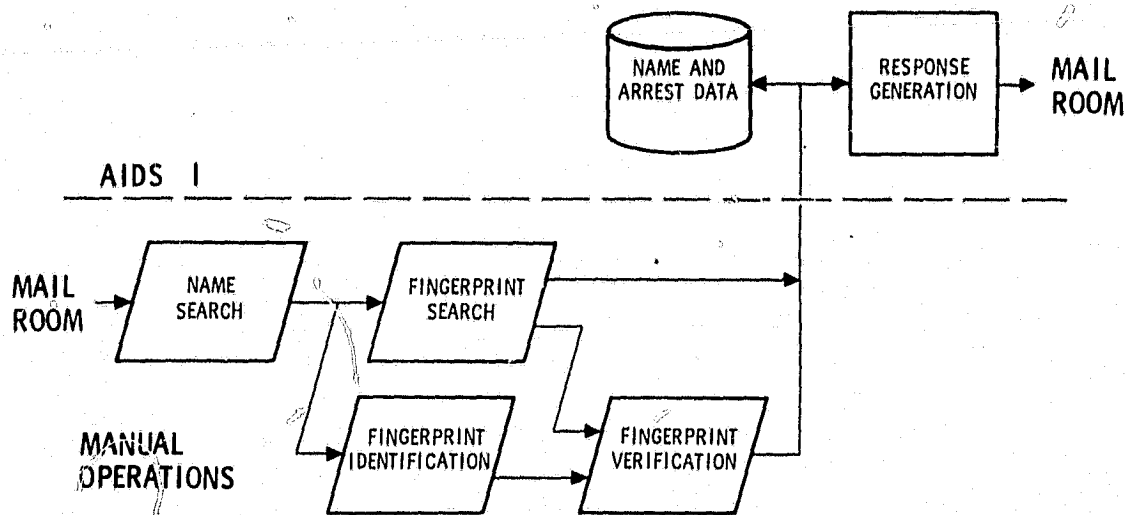


Figure 5-3. Process With AIDS I

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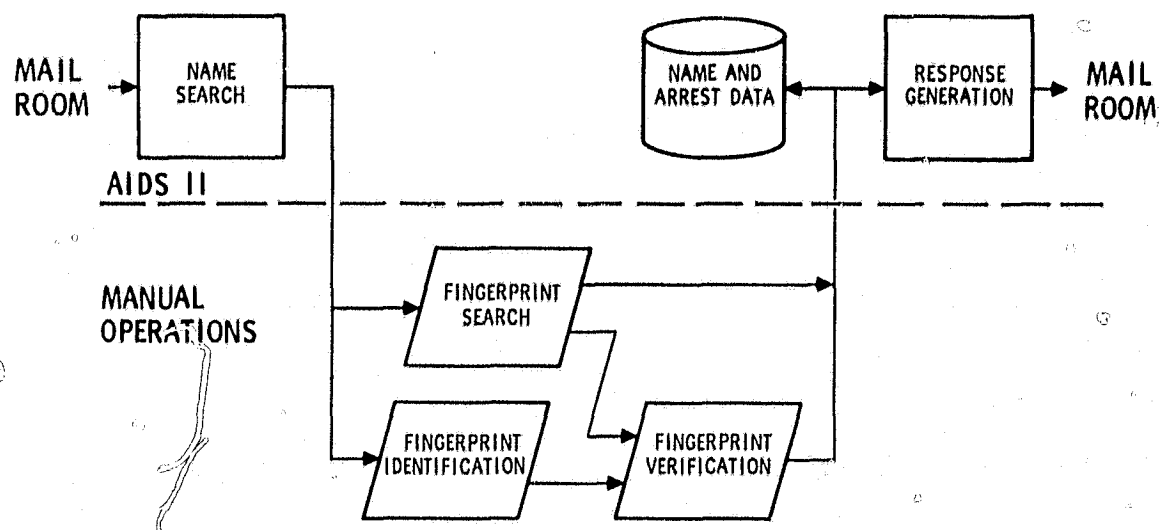


Figure 5-4. Process With AIDS II

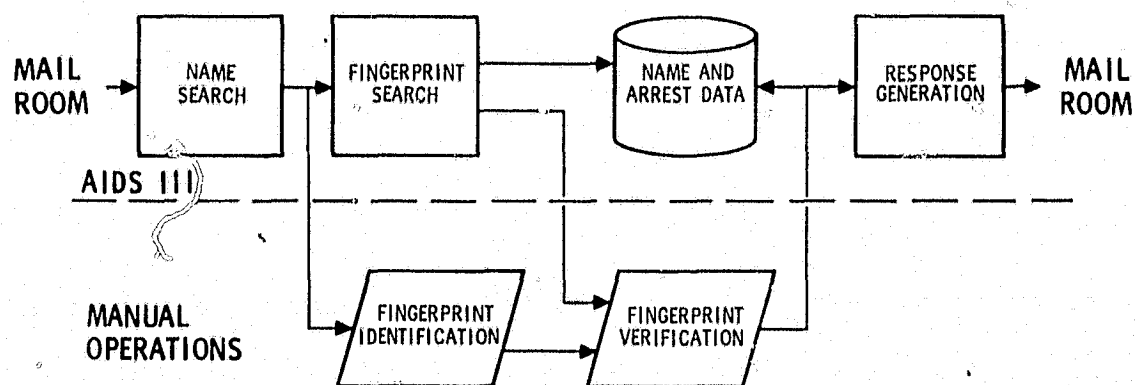


Figure 5-5. Process With AIDS III

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APPENDIX A
DATA DICTIONARY

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APPENDIX A

DATA DICTIONARY

Originally, the AIDS III evaluation was to be completed by February 1980. As this date approached, it became obvious that additional design data was required to complete the evaluation.

The Data Dictionary, Table A-1, indicates the unspecified or insufficiently specified data elements required to complete the AIDS III evaluation. It is recognized that no system can be completely specified until the detailed design has been completed and even then there may be changes in a system as complicated as AIDS III. However, without a major portion of the missing or incomplete facts, the methodology which was to be employed could not be used.

The Data Dictionary is in the form of a matrix. The rows are the names of the data elements grouped by technical area. These are:

- Process control: Used for dynamic computer-based simulation.
- Operations and system support: Needed for both operational and economic feasibility.
- Cost data.
- Data management: Needed primarily for operational feasibility but which may raise technical feasibility issues when specified.

The columns of the matrix include:

- Description: Specific data elements.
- Disposition or status: Used to maintain an audit trail of documents submitted.
- Quantity specified: For quantifiable items with their associated uncertainty.
- Description: For items that can only be qualitatively specified.
- Unit of measure.
- Derivation method: How the quantity was derived (e.g., measured, calculated, estimated, other).
- Date required by JPL: To meet the August final evaluation due date.
- Use in the evaluation.

All data items were delivered by May 7, 1980.

Table A-1. Data Dictionary

Major Category	Data Element	Description	Disposition or Status	Quantity Specified (Expected Value +30 if Applicable)	Unit of Measure	Derivation Method (How Measured or Calculated or Estimated)	Applicable RI Contract or Study (if Known)	Date Required by JPL	Use in Evaluation
Process control	Configuration & capacities	Manned stations		*	Doc or trans	N/A	*	May 1, 1980	Operational feasibility
		Parallel Series				N/A			
		Storage							
		Computers & peripherals							
		Parallel Series							
		Primary series			Bytes	N/A			
		Secondary series			Bytes	N/A			
		Speed			IPS	*			
		Data entry terminals							
		Communication links							
Work load		Nodes			Bytes				
		Node buffer							
		Ports							
		Lines							
		Speeds							
Queueing		For manned stations			Baud				
		For computers			Doc/hr				
		For communications links			Trans/hr				
					BPS				
		Discipline			N/A				
		Non-priority			No. of levels				
		Priority			If yes, doc/				
		Batch			batch; if no,				
					min/doc or				
					batch				
				*		*	*	May 1, 1980	Operational feasibility

*To Be Supplied N/A = Not Applicable

Table A-1. Data Dictionary (Continuation 1)

Major Category	Data Element	Description	Disposition or Status	Quantity Specified (Expected Value + 3σ if Applicable)	Derivation Method (How Measured or Calculated or Estimated)	Applicable RI Concept or Study (if known)	Date Required by JPL	Use in Evaluation
Process control (cont'd.)	Queueing (cont'd.)	Immediate departure Other Channel type Single queue multiserver Multi queue multiserver Service time		*	Explain	*	May 1, 1980	Operational feasibility
				*	Per function Per function Hr/doc Trans/sec	*	May 1, 1980	Operational feasibility
		Arrival rate (at every location & specifically at the system entry point & the entry points to communication links & computers)		*(mean statistical deviation & distribution if known)	Doc/hr or trans/sec	*	May 1, 1980	Operational feasibility
		Transportation Configuration		*	Ft/sec	*	May 1, 1980	Operational feasibility
		Speed		*		*	May 1, 1980	Operational feasibility
		Access/exit mode		*		*	May 1, 1980	Operational feasibility

*To Be Supplied

Table A-1. Data Dictionary (Continuation 2)

Major Category	Data Element	Description	Disposition or Status	Quantity Specified (Expected Value +3σ if Applicable)	Unit of Measure	Derivation Method (How Mea- sured or Calculated or Estimated)	Applicable EI Con- tract or Study (if Known)	Date Required by JPL	Use in Evaluation
Process control (cont'd.)	Feedback & control	Monitoring (parameters used to effect system control & assist management in making decisions) Arrivals, queues Waiting times Service times Failures, errors Response times Configuration Operator availability Operator performance Transaction status & location Turnaround time Control Sequencing Load leveling Surge Drop Reconfiguration Balancing Machine/machine Operator/operator Operator/machine Maintenance personnel response time In-house capability Contractor		*			*	May 1, 1980	Operational feasibility
				*			*	May 1, 1980	Operational feasibility
Maintenance strategy (all equip- ment)				*			*	May 1, 1980	Operational feasibility
				*			*	May 1, 1980	Operational feasibility

*To Be Supplied N/A = Not Applicable

Table A-1. Data Dictionary (Continuation 3)

Major Category	Data Element	Description	Disposition or Status	Quantity Specified (Expected Value +3σ if Applicable)	Derivation Method (How Measured or Calculated or Estimated)	Applicable RI Contract or Study (if Known)	Date Required by JPL	Use in Evaluation
Process control (cont'd.)								
Maintenance strategy (cont'd.)		Scheduled preventive maintenance		*	Times/month	*	May 1, 1980	Operational feasibility
		Unscheduled maintenance			Times/month			Operational feasibility
		MTBF			Hours			
		MTTR			Hours			
Operations & system support								
System analysts								
Programmers								
Operators					Number of personnel by skill level by shift			Operational & economic feasibility
Technicians								Operational & economic feasibility
Supervisors								
Managers								
Manpower use to accommodate work load & system dynamics								
Cost Data								
AIDS III. capital equipment costs		New capital equipment			FF 80 dollars by fiscal year			Economic feasibility
		Design & development						
		Software design & development						
		File conversions						
		Installation (physical)						
		Training						
		Acceptance testing						
		Contracts						
		Misc. contingency						
		Total		*	FF 80 dollars by fiscal year	*	May 1, 1980	Economic feasibility

*To Be Supplied

Table A-1. Data Dictionary (Continuation 4)

Major Category	Data Element	Description	Disposition or Status	Quantity Specified (Expected Value +30 if Applicable)	Derivation Method (How Measured or Calculated or Estimated)	Applicable RI Contract or Study (if Known)	Date Acquired by JPL	Use in Evaluation
Cost data (cont'd.)								
AIDS III recurrent costs		Operating personnel AIDS III, manual Supervisory personnel AIDS III, manual Management Software maintenance In-house Contract Parts & supplies Utilities (if different from existing system) Training, recruiting Services (e.g., tech services) Total		*	FY 80 dollars by fiscal year	*	May 1, 1980	Economic feasibility
		Capital equipment Installation Acceptance testing Training Contracts Total		*	FY 80 dollars by fiscal year	*	May 1, 1980	Economic feasibility
AIDS III capital equipment replacement (if any anticipated during life cycle)				*		*		
Implementation plans		AIDS III AIDS II to III phase-over Deimplementation of manual system		Description to be supplied		*	May 1, 1980	Economic feasibility

*To Be Supplied

Table A-1. Data Dictionary (Continuation 5)

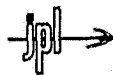
Major Category	Description	Disposition or Status	Description (if Yes, Explain)	Unit of Measure	Derivation Method (How Measured or Calculated or Estimated)	Applicable RI Concept or Study (if known)	Date Required by JPL	Use in Evaluation
Data management								
Data manipulation	Data entry Data growth Updating File conversions Format modifications		*	N/A	N/A	*	May 1, 1980	Operational feasibility
Query capabilities	Degrees of generalities Browse capabilities Language needed User interfaces described							
Applications	Applications versions Program/data independence Methods of data retrieval management							
Data communications	On-line/batch utilization Type of network Update mode initiation Data base/data processing distribution configuration Security/privacy controls		*	N/A	N/A	*	May 1, 1980	Operational feasibility

*To Be Supplied N/A = Not Applicable

APPENDIX B
BRIEFING CHARTS

**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

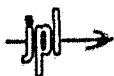
AIDS III EVALUATION EXECUTIVE SUMMARY



August 29, 1980

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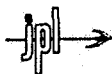


FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

AIDS III EVALUATION EXECUTIVE SUMMARY

STUDY OBJECTIVES

- EVALUATE THE TECHNICAL, OPERATIONAL, AND ECONOMIC FEASIBILITY OF AIDS III
 - THE SUBJECT OF THE AUGUST 1980 REPORT
- PROPOSE, DEVELOP, EVALUATE, AND RANK ALTERNATIVES TO AIDS III
 - THE SUBJECT OF THE MARCH 1981 FINAL REPORT



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
AIDS III EVALUATION REPORT

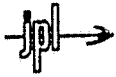
ESSENTIAL ELEMENTS OF ANALYSIS

GENERAL

- DETERMINE IF THE MAY 1980 AIDS III SYSTEM IS TECHNICALLY, OPERATIONALLY, AND ECONOMICALLY FEASIBLE FOR AUTOMATING THE FBI IDENTIFICATION DIVISION
- DETERMINE IF ALL THREE FEASIBILITY CRITERIA WILL BE SATISFIED SIMULTANEOUSLY

ECONOMIC FEASIBILITY

- DETERMINE IF THE LIFE CYCLE COST (1980 - 2004) OF AIDS III IS LESS THAN THE LIFE CYCLE COST OF THE CURRENT SYSTEM UNDER A VARIETY OF FUTURE SYSTEM WORK LOADS
- DETERMINE IF THE ESTIMATED ANNUAL PERSONNEL COST SAVINGS ARE SUFFICIENT TO JUSTIFY AIDS III IMPLEMENTATION COSTS



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AUTOMATION STUDY
AIDS III EVALUATION REPORT**

ESSENTIAL ELEMENTS OF ANALYSIS (cont)

ECONOMIC FEASIBILITY (cont)

- DETERMINE IF THE PREDICTED IMPROVED PERFORMANCE OF AIDS III OVER THE CURRENT SYSTEM JUSTIFIES THE AIDS III IMPLEMENTATION COSTS
- DETERMINE THE PLANNED ANNUAL EXPENDITURES
- DETERMINE WHICH OF THE UNCERTAINTIES IN THE FUTURE ECONOMIC AND OPERATIONAL ENVIRONMENT HAVE A SIGNIFICANT EFFECT ON
 - AIDS III COST ESTIMATES
 - COST COMPARISONS BETWEEN AIDS III AND THE CURRENT SYSTEM

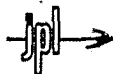


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AUTOMATION STUDY
AIDS III EVALUATION REPORT**

ESSENTIAL ELEMENTS OF ANALYSIS (cont)

OPERATIONAL FEASIBILITY

- DETERMINE IF THE SYSTEM DESIGN MEETS THE FUNCTIONAL AND PERFORMANCE REQUIREMENTS
- DETERMINE IF THE REQUIRED HARDWARE AND SOFTWARE ARE:
 - AVAILABLE
 - MUTUALLY COMPATIBLE
 - ADEQUATE

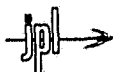


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AIDS III EVALUATION REPORT**

ESSENTIAL ELEMENTS OF ANALYSIS (cont)

TECHNICAL FEASIBILITY

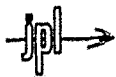
- DETERMINE IF THE TECHNOLOGIES EMPLOYED BY THE SYSTEM ARE
 - COMMERCIALLY AVAILABLE
 - UNDER DEVELOPMENT
 - ONLY CONCEPTUALLY DESIGNED
- DETERMINE THE RISKS INVOLVED IN COMMITTING TO THE TECHNICAL APPROACHES SELECTED
- DETERMINE IF THE TECHNOLOGIES EMPLOYED WILL BE OBSOLETE AND THUS NO LONGER COST EFFECTIVE BY THE OPERATIONAL DATE



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AUTOMATION STUDY
AIDS III EVALUATION REPORT**

ESSENTIAL ELEMENTS OF THE ANALYSIS (cont)

- ENVIRONMENTAL ANALYSIS
 - DETERMINATION OF POTENTIAL DRIVERS THAT CAN PRODUCE CHANGES IN THE WORK LOAD AND ANALYSIS OF THEIR IMPACTS:
 - ECONOMIC AND DEMOGRAPHIC TRENDS
 - TRENDS IN TECHNOLOGY
 - TRENDS IN POLITICAL CONCERNS
 - ANTICIPATED ACTIONS OF OTHER FEDERAL AGENCIES AND STATE AGENCIES
 - ANTICIPATED EVENTS
 - DEVELOPMENT OF SCENARIOS TO CHARACTERIZE THE RELATIONSHIPS OF THE DRIVERS AND THE WORK LOAD
 - ESTIMATION OF BOUNDS FOR EACH SCENARIO
 - STUDY OF THE LOCI AND MECHANISMS OF CONTROL IN EXTERNAL FEDERAL AND STATE AGENCIES:
 - BY USERS OF IDENTIFICATION DIVISION SERVICE
 - BY "STAKEHOLDERS"
 - ANALYSIS OF THE CLIMATE FOR CHANGE IN EXTERNAL AGENCIES
 - ASSESSMENT OF THE LIKELIHOOD OF CHANGE IN WORKLOAD

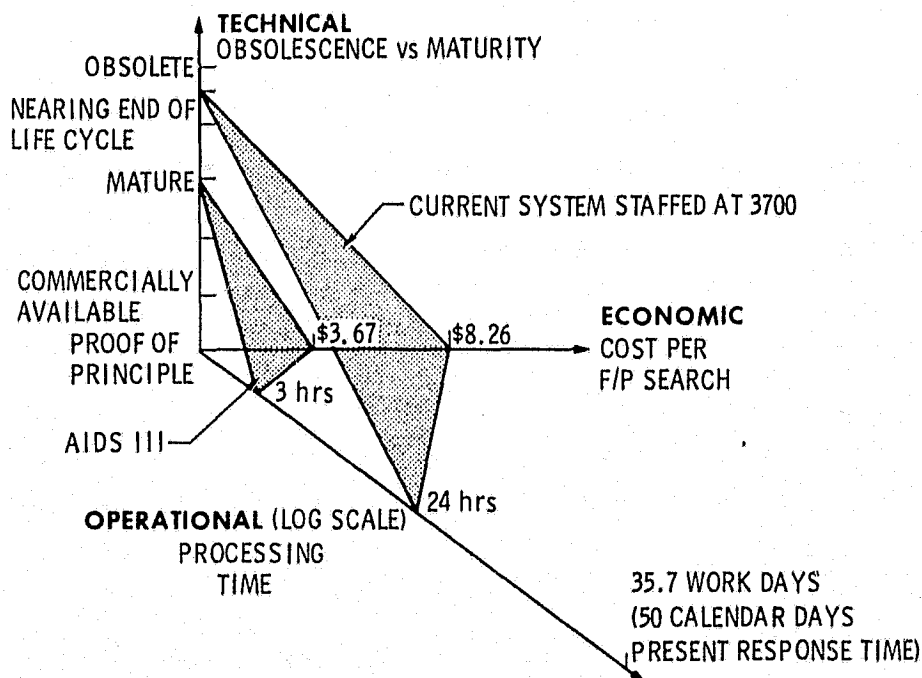


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AUTOMATION STUDY
AIDS III EVALUATION EXECUTIVE SUMMARY

- THE PRESENT SYSTEM PERFORMANCE IS NOT FEASIBLE
 - 50 DAY RESPONSE TIME
 - 30% PERSONNEL TURNOVER
 - 60 MILLION A YEAR BUDGET
- AIDS III PROVIDES PERFORMANCE AND COST BENEFITS IF
 - THE COST ESTIMATES ARE ON TARGET
 - THE TECHNICAL PROBLEMS ARE SOLVED
 - THE OPERATING MARGINS ARE IMPROVED
- AUTOMATING IDENTIFICATION vs IMPROVING THE SEMI - AUTO SYSTEM SHOULD BE INVESTIGATED FURTHER
 - TO FIND THE MOST COST EFFECTIVE SOLUTION
 - IMPROVED MANUAL/AIDS II AND/OR ATS II AS A NEAR TERM SOLUTION
 - AIDS III OR OTHER AUTOMATED SYSTEM FOR LONG TERM
- RECOMMEND CONTINUING WITH THE SECOND PHASE OF THE JPL STUDY



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
**FEASIBILITY COMPARISON
AIDS III vs CURRENT SYSTEM**





**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
EXECUTIVE SUMMARY**

CONTRACTUAL REQUIREMENT

- PERFORM A TOP DOWN FUNCTIONAL ANALYSIS OF ID (SEE VOLUME VII)

MAJOR FINDINGS

- 49 OF 58 POSSIBLE FUNCTIONS WHICH ARE CANDIDATES FOR AUTOMATION ARE BEING AUTOMATED BY AIDS III
 - e.g., FINGERPRINT CLASSIFICATION, WORK LOAD BALANCING, . . .

IMPLICATIONS

- THE POTENTIAL ADVANTAGES OF AUTOMATION MAY NOT BE FULLY REALIZED
- THE SYSTEM MAY NOT BE AS COST EFFECTIVE AS A DIFFERENT APPROACH

RECOMMENDED ACTION

- DEVELOP A TOP-DOWN PLAN AND CRITERIA FOR AUTOMATING AIDS III
- DETERMINE THE PRIORITY AND ORDER IN WHICH FUNCTIONS ARE SELECTED FOR AUTOMATION
- RE-EXAMINE THE PLAN AS TECHNOLOGY EVOLVES AND CHANGES THE ECONOMIC ENVIRONMENT



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
EXECUTIVE SUMMARY**

CONTRACTUAL REQUIREMENT

- DETERMINE FUNCTIONS PERFORMED BY MANUAL, AIDS I, AIDS II, (SEE VOLUME V) AND AIDS III (SEE VOLUME IX)

MAJOR FINDINGS

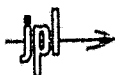
- THERE ARE MISSING AND UNSUBSTANTIATED PERFORMANCE REQUIREMENTS. e.g.
 - I.D. DIVISION GUIDELINE RESPONSE TIME IS NOT BASED ON USER REQUIREMENTS
 - SYSTEM PERFORMANCE IN TERMS OF ALLOWABLE MISS RATE IS NOT SPECIFIED

IMPLICATIONS

- FUNCTIONAL AND PERFORMANCE REQUIREMENTS (SEE VOLUME IX) COULD NOT BE USED PER SE AS OPERATIONAL FEASIBILITY CRITERIA
- SENSITIVITY TESTING WAS EMPLOYED AS AN OPERATIONAL AND ECONOMIC FEASIBILITY METRIC

RECOMMENDED ACTION

- DEVELOP PERFORMANCE REQUIREMENTS BASED ON FEDERAL AND LOCAL GOVERNMENT NEEDS



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
EXECUTIVE SUMMARY**

CONTRACTUAL REQUIREMENT

- PERFORM AN EVALUATION OF THE EXTERNAL, SOCIETAL ENVIRONMENT OF THE ID DIVISION (SEE VOLUME VI)

MAJOR FINDINGS

- THE ENVIRONMENT OF THE IDENTIFICATION DIVISION IS INTRICATE, COMPLEX, AND VARIABLE
- CONTROL MAY BE EXERCISED BY EXTERNAL AGENCIES
- EXTERNAL CONTROLS ARE NOT CONCENTRATED IN ONE CENTER AND THESE CONTROLS ARE NOT USED IN UNISON
- GROUPING OF USERS THAT CATEGORIZE THE ENVIRONMENT COULD NOT BE FOUND
 - e.g., PER CAPITA SUBMISSION TO THE DIVISION DO NOT CORRELATE WITH THE DEGREE OF POPULATION DENSITY OF THE STATES

IMPLICATIONS

- A COMPLETE SURVEY OF THE 50 STATES AND THE FEDERAL GOVERNMENT AGENCIES THAT USE THE IDENTIFICATION DIVISION SERVICE IS REQUIRED

RECOMMENDED ACTION

- ALL 50 STATES SHOULD BE INTERVIEWED OR SURVEYED TO DETERMINE USER REQUIREMENTS AND OTHER ENVIRONMENTAL ISSUES



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
EXECUTIVE SUMMARY**

CONTRACTUAL REQUIREMENT

- PERFORM AN EVALUATION OF THE EXTERNAL, SOCIETAL ENVIRONMENT OF THE ID DIVISION (SEE VOLUME VI)

MAJOR FINDINGS

- THE ENVIRONMENT OF THE IDENTIFICATION DIVISION IS INTRICATE, COMPLEX, AND VARIABLE
- CONTROL MAY BE EXERCISED BY EXTERNAL AGENCIES
- EXTERNAL CONTROLS ARE NOT CONCENTRATED IN ONE CENTER AND THESE CONTROLS ARE NOT USED IN UNISON
- GROUPING OF USERS THAT CATEGORIZE THE ENVIRONMENT COULD NOT BE FOUND
 - e.g., PER CAPITA SUBMISSION TO THE DIVISION DO NOT CORRELATE WITH THE DEGREE OF POPULATION DENSITY OF THE STATES

IMPLICATIONS

- A COMPLETE SURVEY OF THE 50 STATES AND THE FEDERAL GOVERNMENT AGENCIES THAT USE THE IDENTIFICATION DIVISION SERVICE IS REQUIRED

RECOMMENDED ACTION

- ALL 50 STATES SHOULD BE INTERVIEWED OR SURVEYED TO DETERMINE USER REQUIREMENTS AND OTHER ENVIRONMENTAL ISSUES



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
EXECUTIVE SUMMARY**

CONTRACTUAL REQUIREMENT

- MEASURE CURRENT WORK LOAD (AVERAGE AND PEAK) (SEE VOLUME V)

MAJOR FINDINGS

- CURRENT SYSTEM BACKLOGS ARE GROWING
- AVERAGE RESPONSE TIME IS 50 DAYS

IMPLICATIONS

- THE CURRENT SYSTEM, AS PRESENTLY CONFIGURED AND STAFFED, MAY NOT MEET LAW ENFORCEMENT AND APPLICANT REQUIREMENTS

RECOMMENDED ACTION

- A WELL CONCEIVED PLAN IS IMPERATIVE EITHER TO IMPROVE AND/OR AUTOMATE THE SYSTEM
- THE SECOND PHASE OF THE JPL STUDY WILL RECOMMEND IMPROVEMENTS TO THE CURRENT SYSTEM, WHICH MAY ALLEVIATE THE PROBLEM AND INVESTIGATE AUTOMATION STRATEGIES TO IMPROVE THE BENEFITS OBTAINED FROM THE INVESTMENT IN AUTOMATION



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
EXECUTIVE SUMMARY**

CONTRACTUAL REQUIREMENT

- PROJECT FUTURE WORK LOAD (SEE VOLUME VI)

MAJOR FINDINGS

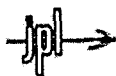
- EXTERNAL TRENDS WILL HAVE MINIMAL IMPACT ON THE VOLUME AND MIX OF WORK LOAD
- FEDERAL AND STATE AGENCIES ARE CAPABLE OF INITIATING CHANGES THAT WILL AFFECT THE WORK LOAD THROUGH THE USE OF FISCAL AND POLICY CONTROLS
 - NO STRONG PRESSURES ARE APPARENT THAT LEAD TO CHANGES
- THE WORK LOAD IS JUDGED TO BE APPROACHING A STEADY STATE
- PULSES SUCH AS "BOAT PEOPLE" HAVE BEEN EXPERIENCED WHICH TEMPORARILY INCREASE THE WORK LOAD
 - THESE EVENTS ARE UNPREDICTABLE

IMPLICATIONS

- ANY SIGNIFICANT INCREASE OR SURGE SATURATES AIDS III AND REQUIRES THE ADDITION OF PROCESSING CAPABILITY OR OVERTIME (SEE VOLUME III)
- PROCESSING CAPABILITY IS TOO TIGHTLY SIZED TO THE NOMINAL WORK LOAD AND MIX OF APPLICANTS TO CRIMINAL INQUIRIES

RECOMMENDED ACTION

- INCREASE WORK LOAD CAPACITY TO MAKE THE SYSTEM MORE ROBUST AND CAPABLE OF HANDLING SURGES IN AN UNCERTAIN ENVIRONMENT
- DEVELOP A DESIGN GUIDELINE REQUIRING THE SYSTEM DESIGNERS TO KEEP WORK STATION UTILIZATION BELOW A SPECIFIED VALUE FOR THE NOMINAL WORK LOAD



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
EXECUTIVE SUMMARY**

CONTRACTUAL REQUIREMENT

- DETERMINE THE TECHNICAL FEASIBILITY OF AIDS III (SEE VOLUME II)

MAJOR FINDINGS

- CURRENT TECHNOLOGY IS SUFFICIENT TO CREATE A TECHNICALLY FEASIBLE VERSION OF AIDS III.
- HOWEVER, THE DESIGN SPECIFIED BY ROCKWELL INTERNATIONAL IS DEFICIENT IN THE AREAS OF PROCESS CONTROL, AUTOMATED IMAGE RETRIEVAL, AND DATA BASE MANAGEMENT

IMPLICATIONS

- THESE DEFICIENCIES JEOPARDIZE THE OPERATIONAL AND ECONOMIC FEASIBILITY

RECOMMENDED ACTION

- CORRECT THE DEFICIENCIES IN THE AIDS III DESIGN IN THE AREAS DESCRIBED IN VOLUME II USING A TOP-DOWN, SYSTEM ENGINEERING APPROACH



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
EXECUTIVE SUMMARY**

CONTRACTUAL REQUIREMENT

- DETERMINE OPERATIONAL FEASIBILITY (SEE VOLUME III)

MAJOR FINDINGS

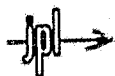
- JPL NEEDED TO ADD 5 WORK STATIONS TO ROCKWELL'S PROPOSED DESIGN TO ACHIEVE OPERATIONAL FEASIBILITY
- AIDS III CAN BE MADE FEASIBLE IF ALL THE TECHNICAL DEVELOPMENTS ARE SUCCESSFUL
- AIDS III IS SENSITIVE TO SUBSYSTEM AVAILABILITY

IMPLICATIONS

- OPERATIONAL FEASIBILITY IS MARGINAL
- IF SUBSYSTEM AVAILABILITY FALLS BELOW 93% IN THREE SPECIFIC CASES, THE SYSTEM WILL SATURATE AND QUEUES WILL GROW OR OVERTIME WILL BE REQUIRED TO MAINTAIN RESPONSE TIME

RECOMMENDED ACTION

- RE-EVALUATE SYSTEM CONFIGURATION AND ARCHITECTURE TO ELIMINATE POTENTIAL PROBLEMS
- IN THE SECOND PHASE OF THE JPL STUDY, ALTERNATIVE SYSTEMS WILL BE DEVELOPED WHICH WILL SEEK TO CORRECT THESE DEFICIENCIES



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
EXECUTIVE SUMMARY**

CONTRACTUAL REQUIREMENT

- DETERMINE ECONOMIC FEASIBILITY (SEE VOLUME IV)

MAJOR FINDINGS

- FOR THE \$50 MILLION IMPLEMENTATION COST, AIDS III WILL PRODUCE STAFF REDUCTIONS AND COST SAVINGS
 - 1000 FEWER EMPLOYEES
 - COST PER TRANSACTION REDUCED FROM \$5.45 TO \$4.35
- AIDS ECONOMIC BENEFITS ARE SENSITIVE TO COST UNCERTAINTIES
- IF AIDS III IS NOT TECHNICALLY FEASIBLE IT CANNOT BE ECONOMICALLY FEASIBLE SINCE THE TECHNOLOGY CANNOT BE DEVELOPED FOR THE ESTIMATED COSTS

IMPLICATIONS

- INCREASES OR OVERRUNS OF 25% IN IMPLEMENTATION COSTS OR A 25% DECREASE IN LABOR COST SAVINGS CAN
 - DELAY THE PAYBACK YEAR FROM 1991 to 1998
 - INCREASE LIFE CYCLE COST TO A VALUE GREATER THAN THE CURRENT SYSTEM LCC

RECOMMENDED ACTION

- TAKE STEPS TO REDUCE TECHNICAL UNCERTAINTIES
- DO AN INDEPENDENT COST ESTIMATE
- CONSIDER ALTERNATIVE SYSTEMS WHICH PROVIDE BETTER COST PERFORMANCE FOR THE INVESTMENT



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
EXECUTIVE SUMMARY**

CONTRACTUAL REQUIREMENT

- EVALUATE TANGIBLE BENEFITS OF AIDS III (SEE VOLUME IV)

MAJOR FINDINGS

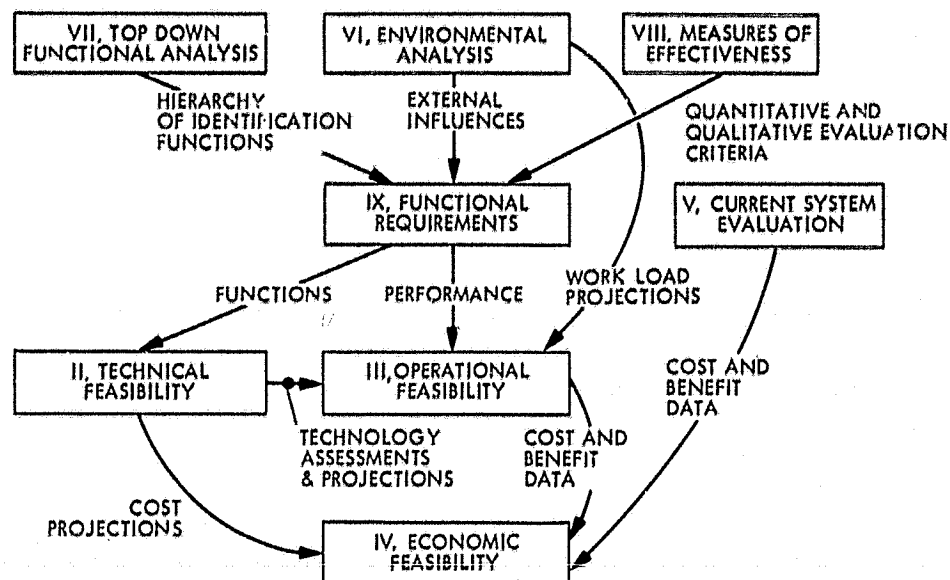
- AIDS III MAIL ROOM TO MAIL ROOM RESPONSE TIME WILL BE BETTER THAN THAT OF THE CURRENT SYSTEM
 - 50 DAYS FOR THE PRESENT CONFIGURATION AND STAFFING LEVEL
 - 24 HOURS FOR A CURRENT SYSTEM STAFFED AT THE 3,700 LEVEL
 - 3 HOURS FOR AIDS III (EXCEPT FOR 8-HOUR DELAYS THROUGH THE MANUAL SYSTEM FOR 20% OF THE 1993 WORK LOAD)
- THE COST PER FINGERPRINT (TECHNICAL) SEARCH WILL DROP FROM \$7.76 TO \$3.67
- THE COST PER TRANSACTION WILL BE \$4.35 VICE \$5.45
- THE MISS RATE IN FINGERPRINT (TECHNICAL) SEARCH WILL DECREASE FROM 24% TO 5% (REF VOLUME III)

IMPLICATIONS

- SIGNIFICANT TANGIBLE BENEFITS COULD RESULT FROM AUTOMATING THE IDENTIFICATION DIVISION SYSTEM



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
**INTERRELATIONSHIP OF AIDS III EVALUATION
REPORT VOLUMES**



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
**MEASURED RESPONSE TIME
(Calendar Days)**

	CRIMINAL		APPLICANT		AVERAGE OVERALL (WEIGHTED BY VOLUME)
	IDENT	NON-IDENT	IDENT	NON-IDENT	
DEC 17, 1979					
SAMPLE SIZE	44	32	97	NOT MEASURED	
AVERAGE	49.0	51.8	33.9		50.1*
STD. DEV.	23.3	6.5	18.3		
MAY 7, 1980					
SAMPLE SIZE	136	200	200	200	
AVERAGE	71.9	54.7	63.0	24.6	46.43**
STD. DEV.	28.6	12.2	25.3	5.0	

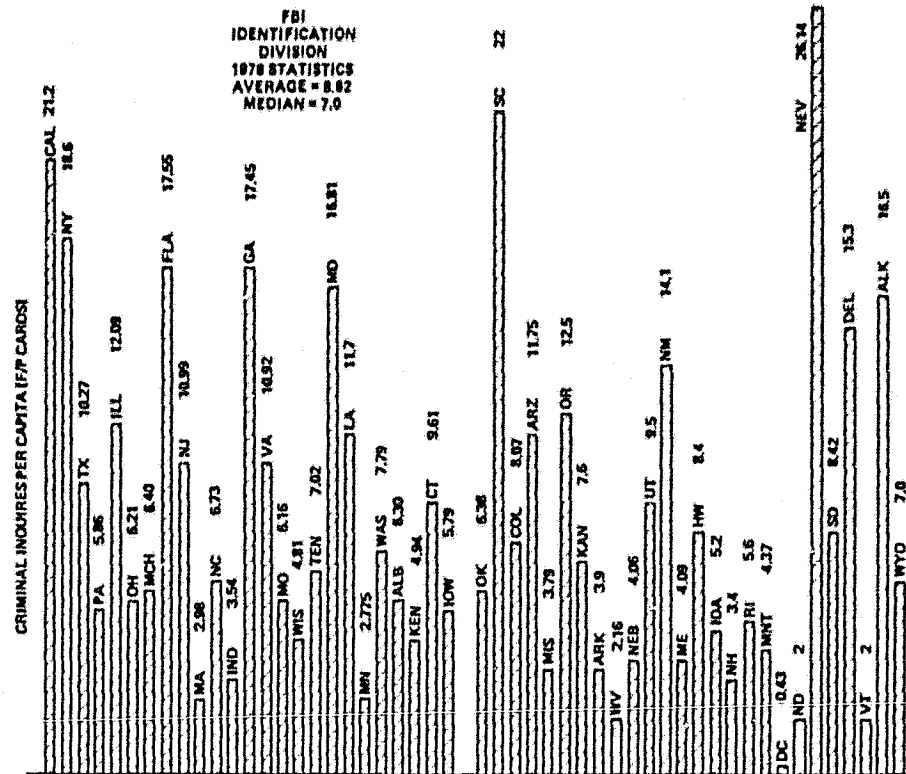
*CRIMINAL ONLY

**65.2 CRIMINAL ALONE

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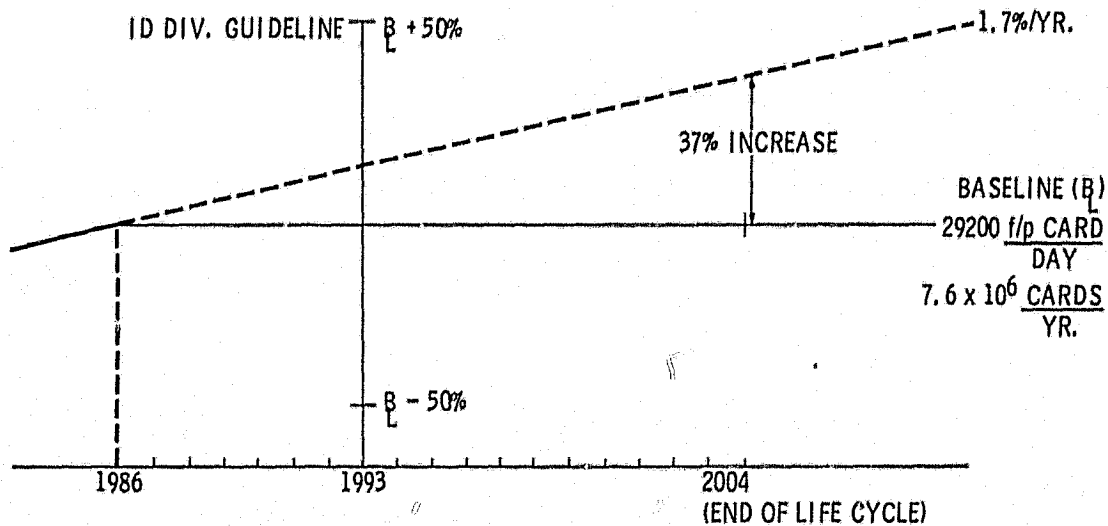


FBI FINGERPRINT IDENTIFICATION AUTOMATION STUDY



FBI FINGERPRINT IDENTIFICATION AUTOMATION STUDY EXECUTIVE SUMMARY

I.D. DIVISION GUIDELINES PROJECT WORK LOAD





FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

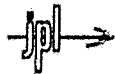
AIDS III TECHNICAL FEASIBILITY

AUGUST 1980



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
AFRS AGING

SUBSYSTEM	AFFECTED COMPONENT	SYMPTOMS OF AGING	SOLUTIONS	OPERATIONAL EFFECTS
CARD HANDLER	CARD FEEDER	FREQUENT CARD JAMS WITH GOOD CARDS	PERIODIC VACUUMING ADJUSTMENT REPLACEMENT	REDUCED THROUGHPUT
SCANNER				
PROGRAMMABLE LIGHT SOURCE	CRT	INCONSISTENT GEOMETRIC IMAGES	ADJUSTMENT REPLACEMENT	DETERIORATION OF MINUTIAE DATA
LENS AND OPTICS	LENS DISPLACEMENT	CHANGE IN IMAGE SCALE AND TRUE RESOLUTION	ADJUSTMENT	REDUCED MINUTIAE DATA QUALITY
	INTERNAL DUST	POOR CONTRAST IN GREY LEVEL	CLEANING	MISSING MUNITIAE DATA
SENSING	DARK CURRENT IN PHOTOMULTIPLIER TUBES	POOR IMAGE INTENSITY AND CONTRAST	REPLACEMENT	MISSING MUNITIAE DATA



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
FILE PROTECTION

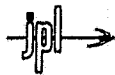
- MAGNETIC DISK FAILURES USUALLY DUE TO HEAD CRASHES
 - CAN BE CAUSED BY SMALL DUST PARTICLES
 - PERIODIC DUMPS OF DISK SHOULD BE PERFORMED
 - RECORD OF TRANSACTIONS SINCE LAST DUMP SHOULD BE RETAINED
- DISK BACK-UP ALTERNATIVES
 - STANDARD TAPE RECORDERS
 - DESIGNED FOR BURSTS OF READING AND WRITING
 - DUMPING OF DISK FILES IS CONTINUOUS
 - DUPLICATE DISKS
 - EXPENSIVE UNLESS REMOVABLE CARTRIDGES ARE USED
 - CARTRIDGES ONLY STORE ABOUT 8 MBYTES OF DATA
 - STREAMING TAPE RECORDERS
 - DESIGNED TO RECORD AND PLAYBACK CONTINUOUS STREAMS OF DATA AT HIGH RATES
 - FAR LESS EXPENSIVE THAN CONVENTIONAL RECORDERS
 - STREAMING CARTRIDGES
 - ADVANTAGES OF STREAMING TAPE RECORDERS
 - RECORDING MEDIUM NOT DIRECTLY HANDLED BY OPERATOR



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

AUTOMATED IMAGE RETRIEVAL

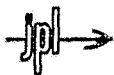
- EXAMINED MARCH, 1979 ROCKWELL REPORT AND MAY 1, 1980 WORK LOADS MEMO 80-007J
- SUBSYSTEM DESIGN IS MORE CONCERNED WITH EQUIPMENT SPECIFICATION THAN FILE MANAGEMENT
 - NO DISCUSSION ABOUT FILE INDEXING
- WORK STATION PROJECTIONS ARE INCONSISTENT.
 - 26 FILE SEGMENTS NEEDED FOR IMAGE COMPARISON REQUIRING AT LEAST 26 WORK STATIONS (MARCH 1979)
 - ONLY 19 WORK STATIONS SHOWN IN MAY 1, 1980 FOLD-OUT
- PROCESS CONTROL
 - UNPREDICTABLE WORK LOAD DISTRIBUTION AT IMAGE COMPARISON WORK STATIONS MAY CAUSE BOTTLENECKS
 - EFFICIENCY DROPS WHEN AN INQUIRY CARD HAS CANDIDATES AT SEVERAL WORK STATION
- FILE SECURITY
 - PROTECTION AGAINST NATURAL DISASTERS AND INTERNAL SABOTAGE IS NOT DISCUSSED
- PHOTOGRAPHIC MEDIA IS PREFERRED OVER MAGNETIC MEDIA AS THE INFORMATION CARRIER



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

**PROPOSED JPL ALTERNATIVE TO MARCH, 1979
ROCKWELL IMAGE RETRIEVAL DESIGN**

- STORE THE INFORMATION IN A SEQUENTIAL, CHRONOLOGICAL, PHOTOGRAPHIC FILE INDEXED BY SEQUENCE NUMBER
- PROCEDURE IS AS FOLLOWS:
 - STEP 1. ASSIGN PCN TO INQUIRY CARD
 - STEP 2. ENCODE EACH INQUIRY CARD
 - STEP 3. PERFORM CANDIDATE SEARCH TO OBTAIN THE SEQUENCE NUMBERS OF THE CANDIDATES
 - STEP 4. CREATE A "REQUEST FOR RETRIEVAL" RECORD CONSISTING OF THE SEQUENCE ADDRESS OF THE CANDIDATE AND THE PCN OF THE INQUIRY
 - STEP 5. SORT THE INQUIRES BY SEQUENCE NUMBER SO THAT THE RETRIEVAL PROCESS IS A BATCH PROCESS, MINIMIZING FILM MOTION
 - STEP 6. RETRIEVE A COPY OF EACH CANDIDATE FROM THE FILMS
 - STEP 7. PRINT THE PCN OF THE INQUIRY ONTO THE COPIES
 - STEP 8. SORT THE COPIES BY PCN AND MERGE THE INQUIRES INTO THIS BATCH. (NOW FOR EACH INQUIRY CARD, ALL THE CANDIDATES ARE DIRECTLY BEHIND IT)
 - STEP 9. DISTRIBUTE THE BATCHES TO SMOOTH THE WORK LOAD OF THE EXAMINERS

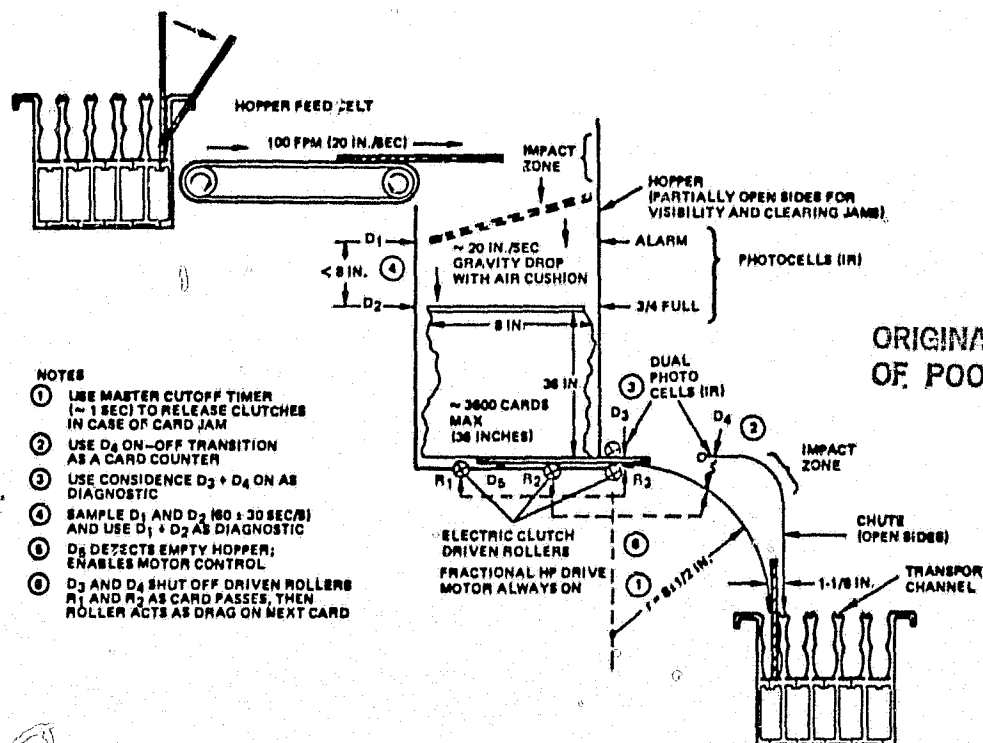


FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
AUTOMATED CARD TRANSPORT

- REVIEWED MAY 1, 1980 ROCKWELL PROCESS CONTROL MEMO 80-008J
- CONVEYOR SYSTEM SHOULD BE TROUBLE-FREE
- CARD BUFFER STATION APPEARS UNRELIABLE
 - 36 INCH FREE-FALL MAY RESULT IN CARDS LANDING ON EDGES AND BEING SUBSEQUENTLY BENT
 - REMOVING BOTTOM CARD FROM 3600 CARD STACK MAY CAUSE SMEARING OF THE FINGERPRINTS
 - TASK OF SEPARATING EXACTLY ONE CARD IS OVER-SIMPLIFIED IN ROCKWELL DESIGN
- JPL ALTERNATIVES TO BUFFER DESIGN
 - HOPPER SHAKING TO ALIGN CARDS
 - DELIVERY MECHANISMS WITH CONTROLLED DROP ALTITUDE
 - LIFO REMOVAL OF CARDS BY SPRING LOADING THE HOPPER BOTTOM TO KEEP THE STACK AT A CONSTANT LEVEL

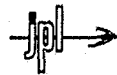


FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
GENERAL OPERATION OF AUTO ALLOCATOR

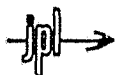


**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

AIDS III OPERATIONAL FEASIBILITY



August 26, 1980



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

OPERATIONAL FEASIBILITY REPORT SUMMARY

AREA OF STUDY	METHODOLOGY EMPLOYED	OBSERVATIONS	IMPLICATIONS
FUNCTIONAL AND PERFORMANCE REQUIREMENTS	ANALYSIS OF ID GUIDELINES AND RELATED DOCUMENTS	<ul style="list-style-type: none">• THE RATIONALE FOR THE PERFORMANCE REQUIREMENTS AND CONSTRAINTS HAS NOT BEEN ESTABLISHED, SEE SECTION V.	FUNCTIONAL AND PERFORMANCE REQUIREMENTS COULD NOT BE USED PER SE AS OPERATIONAL FEASIBILITY CRITERIA.
COMPONENT AVAILABILITY	CALCULATION BASED ON MTBF AND MTTR	<ul style="list-style-type: none">• ESTIMATED AVAILABILITIES ARE BETWEEN 0.988 AND 1.0.	AT THAT LEVEL, THE AVAILABILITIES DO NOT AFFECT STATIC OR DYNAMIC MODELED PROCESSING CAPACITY.
PRODUCTION CAPACITY	STATIC ANALYSIS <ul style="list-style-type: none">• CARD PROCESSING COMPONENTS• DOCUMENT PROCESSING COMPONENTS DYNAMIC ANALYSIS (GPSS) <ul style="list-style-type: none">• CARD PROCESSING COMPONENTS SENSITIVITY ANALYSIS	<ul style="list-style-type: none">• MARGINAL WITHOUT SINGLE-UNIT FAILURES; UNSATISFACTORY WITH SINGLE UNIT FAILURES.• CONCEPT IS INCOMPLETE.<ul style="list-style-type: none">• UPDATES TO FILE NOT SPECIFIED• PORTION SPECIFIED IS ADEQUATE• MEETS ALL RESPONSE TIME REQUIREMENTS WITH FIVE WORK STATIONS ADDED TO FOUR FUNCTIONS.• SENSITIVE TO VOLUME SURGES AND AVAILABILITY OF WORK STATIONS.• SEE VOLUME IV.• INCORPORATED IN DYNAMIC ANALYSIS	MARGINALLY OPERATIONAL, RE-EVALUATE SYSTEM CONFIGURATION AND ARCHITECTURE TO ELIMINATE POTENTIAL PROBLEMS. UNKNOWN IMPACT ON THE AIDS III SYSTEM MARGINALLY OPERATIONAL. IF SUBSYSTEM AVAILABILITY FALLS BELOW 95% (IN TWO CASES), THE SYSTEM WILL SATURATE AND THE BACKLOG WILL GROW.
TRANSPORTATION BETWEEN WORK STATION	STATIC AND DYNAMIC ANALYSIS		



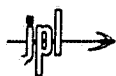
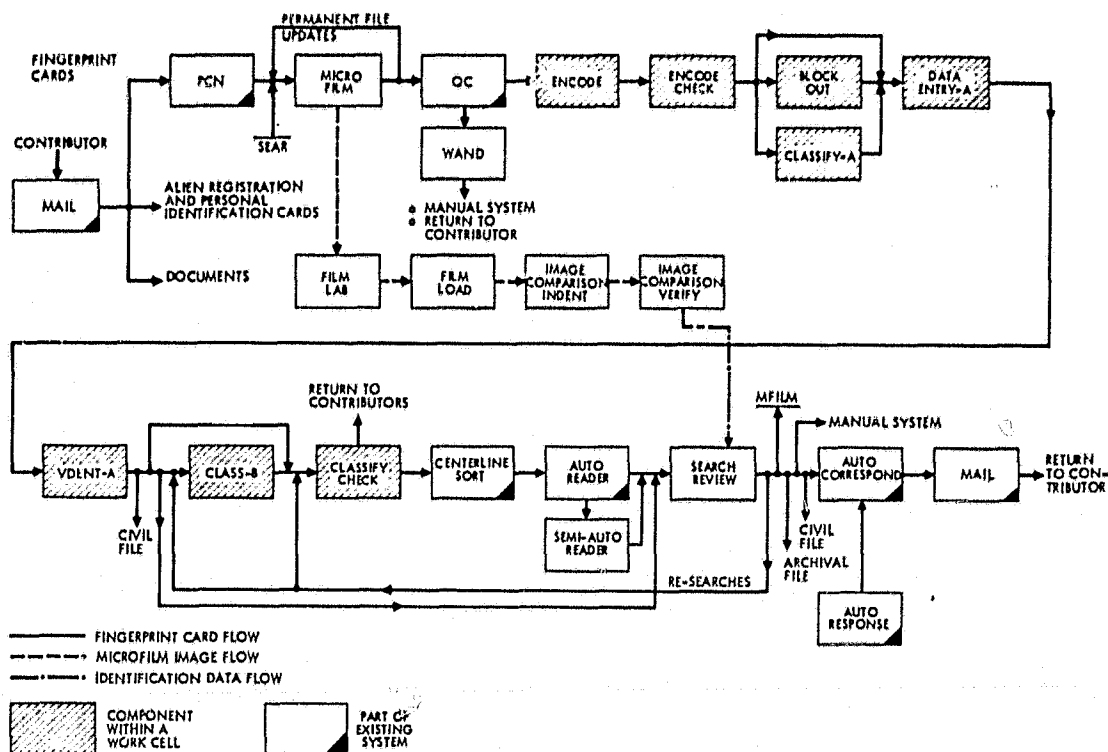
FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

OPERATIONAL FEASIBILITY REPORT SUMMARY (contd)

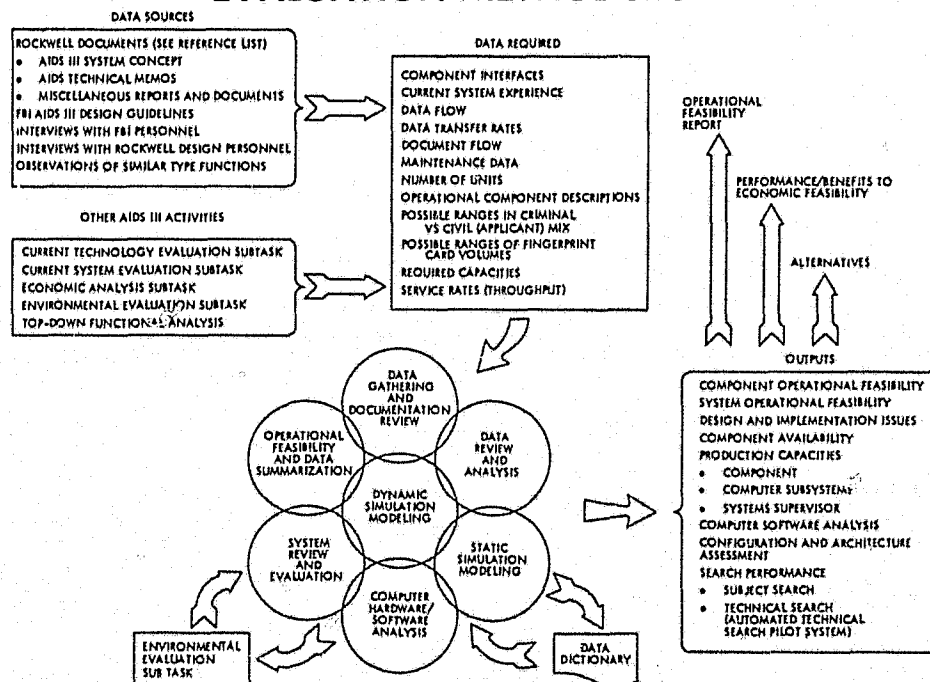
AREA OF STUDY	METHODOLOGY EMPLOYED	OBSERVATIONS	IMPLICATIONS
COMPUTER CONFIGURATION AND ARCHITECTURE	TECHNICAL EVALUATION	<ul style="list-style-type: none">• HARDWARE CONFIGURATION AND SOFTWARE PERFORMANCE REQUIREMENTS NOT FULLY SPECIFIED.• COMPUTER DATA TRANSFER RATES WERE NOT SPECIFIED.• A PROPERLY SIZED CONFIGURATION WITH OFF THE SHELF TECHNOLOGY WILL SUPPORT AIDS III. (SEE VOLUME II AND SECTION II-B OF VOLUME III)	FUNCTIONAL AND PERFORMANCE REQUIREMENTS COULD NOT BE USED PER SE AS OPERATIONAL FEASIBILITY CRITERIA (SEE VOLUME IX) JPL HAS ESTIMATED THESE RATES TO SCOPE THE SUBSYSTEMS (SEE APPENDIX C, VOLUME III).
SEARCH PERFORMANCE <ul style="list-style-type: none">• NAME (SUBJECT)• FINGERPRINT (TECHNICAL)	ANALYSIS OF: <ul style="list-style-type: none">• AIDS II RESULTS• AUTOMATIC TECHNICAL SEARCH PILOT SYSTEM RESULTS	<ul style="list-style-type: none">• PERFORMS BETTER THAN THE MANUAL SYSTEM.• PERFORMS BETTER THAN THE MANUAL SYSTEM.	
DATA BASE MANAGEMENT	TECHNICAL EVALUATION	<ul style="list-style-type: none">• A SPECIAL PURPOSE DATA BASE MANAGEMENT SYSTEM (DBMS) IS TO BE DEVELOPED FOR AIDS III.	THIS APPROACH MAY NOT BE AS COST EFFECTIVE AS A COMMERCIALLY AVAILABLE GENERAL PURPOSE DBMS AND A MAKE/BUY ANALYSIS IS RECOMMENDED.
FILE CONVERSIONS	TECHNICAL EVALUATION	<ul style="list-style-type: none">• THE HIGH RESOLUTION DIGITAL IMAGES GENERATED BY THE TECHNICAL FILE CONVERSION WERE NOT SAVED.• MINUTIAE MASTER FILE, THE COMPUTERIZED CRIMINAL NAME AND RECORD FILES WILL REQUIRE RESTRUCTURING AND REFORMATTING FOR AIDS III.	REPHOTOGRAPHING OF THE MASTER FINGERPRINT FILE IS REQUIRED FOR AUTOMATIC IMAGE RETRIEVAL. THIS IS A COMPUTER FILE TO COMPUTER FILE CONVERSION AND SHOULD BE STRAIGHT FORWARD.
FACILITIES	TECHNICAL EVALUATION	<ul style="list-style-type: none">• SPACE REQUIREMENTS NOT CONSISTENT BETWEEN JANUARY 1980 AND MAY 1980 SYSTEM DESCRIPTIONS.• SAFETY AND FIRE PROTECTION REQUIREMENTS INCOMPLETE.	ADDITIONAL INFORMATION IS REQUIRED FOR ANALYSIS ADDITIONAL INFORMATION IS REQUIRED FOR ANALYSIS.

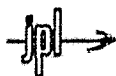


FBI FINGERPRINT IDENTIFICATION AUTOMATION STUDY FINGERPRINT CARD FLOW



FBI FINGERPRINT IDENTIFICATION AUTOMATION STUDY OPERATIONAL FEASIBILITY EVALUATION METHODOLOGY





FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
STATIC CAPABILITY

DESCRIPTION (ACRONYM)	% SPARE CAPACITY OF N UNITS AT 100% AVAILABILITY	% SPARE CAPACITY OF N-1 UNITS AT 100% AVAILABILITY
AUTOMATIC FINGERPRINT READER SYSTEM (AFRS)		
@ 165 CPH (JPL MEASUREMENT)	-20.1	-36.1
@ 250 CPH (PROPOSED ENHANCEMENT)	21.0	-3.2
CLASSIFICATION-A (CLASS-A)*	6.7	-6.7
CLASSIFICATION-B (CLASS-B)*	15.4	-23.1
CLASSIFICATION CHECK (CLCK)*	53.4	2.2
DATA ENTRY-A (DENT-A)*	20.0	0.0

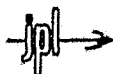
* WORK CELL COMPONENT REDUCES CAPABILITY OF A WORK CELL BY THE PERCENT NOTED



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

STATIC CAPABILITY (cont'd)

DESCRIPTION (ACRONYM)	% SPARE CAPACITY OF N UNITS AT 100% AVAILABILITY	% SPARE CAPACITY OF N-1 UNITS AT 100% AVAILABILITY
DATA ENTRY-B (DENT-B)	3.3	0.8
FILM PROCESSING/COMPOSER (FLAB)	104.7	2.3
IMAGE CAPTURE MICROFILM (MFILM)	18.5	-1.2
IMAGE COMPARISON IDENT. (ICI)	10.9	5.1
IMAGE COMPARISON VERIFY (ICV)	15.7	6.8
PROCESS CONTROL NUMBER APPL. (PCN)	63.3	-18.3
ON LINE INQUIRY (QUERY)	40.6	-100.0
SEARCH REVIEW (SEAR)	14.1	6.5
SEMI-AUTOMATIC F/P READER (SAR)	16.7	0.0
VERIFY DATA ENTRY-A (VDENT-A)*	20.0	0.0
VERIFY DATA ENTRY-B (VDENT-B)	3.3	0.8
WAND OUT OF SYSTEM (WAND)	55.0	24.0
WORK CELL	0.0	-6.5



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

DATA BASE MANAGEMENT SYSTEMS

JPL RECOMMENDS A MAKE/BUY ANALYSIS OF A COMMERCIALY AVAILABLE GENERAL PURPOSE DATA BASE MANAGEMENT SYSTEM (DBMS) FOR THE FOLLOWING REASONS:

- AIDS III FILE STRUCTURES ARE COMPATIBLE WITH A GENERAL PURPOSE DBMS
- THERE ARE COST SAVINGS IN IMPLEMENTATION AND MAINTENANCE
 - AUTOMATIC FILE ACCESS CONTROL AND DATA SECURITY
 - AUTOMATIC AUDIT TRAIL AND BACKUP
- UPGRADES HAVE A MINIMUM IMPACT
 - OPERATING SYSTEM
 - CPU
 - DISKS
 - DATA ELEMENT REVISIONS AND ADDITIONS
- DBMS PARAMETERS CAN BE ADJUSTED TO MEET SPECIFIC NEEDS
- QUERY LANGUAGES ARE AVAILABLE



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

AUTOMATED SUBJECT SEARCH BASIS OF EVALUATION

MANUAL NAME SEARCH	AIDS II AUTOMATED NAME SEARCH	AIDS III AUTOMATED NAME SEARCH
<ul style="list-style-type: none">• NAME AND SEX• MANUAL FILE UPDATE	<ul style="list-style-type: none">• SELECTED PERSONAL AND PHYSICAL DESCRIPTION<ul style="list-style-type: none">• FBI NUMBER• SOCIAL SECURITY NO.• ORIGINATING AGENCY ID. NUMBER• NAME• FINGERPRINT CLASSIFICATION• DATE OF BIRTH• PLACE OF BIRTH• RACE• SEX	<ul style="list-style-type: none">• SPECIFICATIONS BASED UPON AIDS II• NO CHANGES IN DATA ELEMENTS USED• NO CHANGES TO SCREEN FORMATS AND IDENTIFICATION RESPONSES



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
**AUTOMATED SEARCHES VS
MANUAL SYSTEM TEST RESULTS**

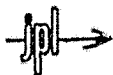
TYPE OF SEARCH	DATE OF REPORT	SEARCHES	POSS. NO. OF IDENTs	MISSES IN MANUAL FOUND IN AUTOMATED SYSTEM			MISSES IN AUTOMATED FOUND IN MANUAL SYSTEM		
				NO. OF MISSES	MISS RATE %	MISSES PER SEARCH	NO. OF MISSES	MISS RATE %	MISSES PER SEARCH
CRIMINAL NAME (SUBJECT)	01/25/80	2356	1262*	120	9.51	0.051	28	2.22	0.012
CIVIL NAME (SUBJECT)	01/25/80	296	296*	26	8.78	0.088	5	1.69	0.017

* BASED ON TECH SEARCH, THERE WERE 136 MISSED FOR CRIMINAL AND 10 FOR CIVIL BY BOTH MANUAL AND AUTOMATED NAME SEARCH



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
**ESTIMATED OPERATIONAL COMPONENT/SUBSYSTEM
DATA TRANSFER REQUIREMENTS SUMMARY**

SUBSYSTEM	NUMBER OF MESSAGES/HOUR	NUMBER OF BYTES PER HOUR
DATA ENTRY AND DISPLAY	23.3K	1,354K
IMAGE RETRIEVAL	7.3K	185K
PCN AND IMAGE CAPTURE	6.1K	37K
SUBJECT SEARCH AND RESPONSE GENERATION	21.5K	783K
SYSTEM SUPERVISOR	61.2K	2,055K
TECHNICAL SEARCH	8.3K	2,614K



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

AIDS III PERFORMANCE
ENHANCED NUMBER OF SERVERS

FRACTION
OF PRINTS

PROCESS TIME
UPPER LIMIT

0.999

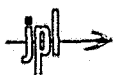
3.8 hours

0.990

3.0 hours

0.950

2.9 hours



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

**COMPARISON OF AIDS III DESIGN
AND MINIMUM ENHANCEMENT FOR SUCCESSFUL SIMULATION**

<u>ABBREVIATION OR ACRONYM</u>	<u>DESCRIPTION</u>	<u>AIDS III DESIGN</u>	<u>MINIMUM FEASIBLE NUMBER</u>
AFRS	AUTOMATIC FINGERPRINT READER SYSTEM	5	5
AUTOCOR	AUTOMATED CORRESPONDENCE	22	24
CSORT	CENTERLINE SORT	12	13
ICI	IMAGE COMPARISON IDENTIFICATION	19	19
ICV	IMAGE COMPARISON VERIFICATION	13	13
MFILM	IMAGE CAPTURE MICROFILM	5	5
PCN	PROCESS CONTROL NUMBER APPLICATION-CARDS	2	2
QC	QUALITY CONTROL CHECK	14	15
SAR	SEMI-AUTOMATIC FINGERPRINT READER	7	8
SEAR	SEARCH REVIEW	15	15
WAND	WAND OUT OF SYSTEM	5	5
-	WORK CELL	15	15

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**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

CONCLUSIONS

- AIDS III CAN BE MADE FEASIBLE IF ALL THE TECHNICAL DEVELOPMENTS ARE SUCCESSFUL
 - SENSITIVE TO SUBSYSTEM AVAILABILITY
 - WITH A SUBSYSTEM AVAILABILITY OF LESS THEN 95% (FOR 2 CASES) THE SYSTEM WILL SATURATE AND THE BACKLOG WILL GROW
- THE REAL TIME PROCESS CONTROL IS UNNECESSARILY COMPLICATED
- THE SUBSYSTEMS ARE HIGHLY INTERDEPENDENT, DEFEATING THE PRINCIPLES OF A "LOOSELY COUPLED ARCHITECTURE"
- A COMMERCIALY AVAILABE GENERAL PURPOSE DATA BASE MANAGEMENT SYSTEM CAN HANDLE THE AIDS III REQUIREMENTS
 - NO SPECIAL FILE REQUIREMENTS
 - FILES ARE INDEPENDENT
- THE SPECIAL CLASSIFIER TERMINALS ARE NOT COST EFFECTIVE
 - NONSTANDARD
 - REQUIRES AN ADDITIONAL STEP IN THE CLASSIFICATION PROCESS
 - REQUIRES OPERATOR TO HAVE BOTH CLASSIFICATION AND DATA ENTRY SKILLS



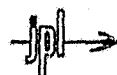
**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

JPL RECOMMENDATIONS TO THE FBI

- REEVALUATE SYSTEM CONFIGURATION AND ARCHITECTURE TO ELIMINATE POTENTIAL PROBLEMS
- SIMPLIFY PROCESS CONTROL CONCEPT
 - DO NOT USE REAL-TIME SIMULATION IN AIDS III FOR MONITORING AND CONTROLLING WORK FLOW
- REVIEW CHOICE OF THE HARDWARE CONFIGURATION
- REVIEW DATA BASE MANAGEMENT SYSTEM (DBMS) USAGE
- REVIEW DEVELOPMENT OF THE SPECIAL CLASSIFIER TERMINALS
- DO A SERIES OF PROTOTYPES TO AID IN THESE DECISIONS
 - SEARCH REVIEW (SEAR) CONSOLES DEVELOPMENT
 - IMAGE COMPARISON TERMINALS DEVELOPMENT
 - DBMS USAGE

**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

**AIDS III
SIMULATION MODEL**



August 27, 1980



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
AIDS III SENSITIVITY TO EQUIPMENT AVAILABILITY
(ESTIMATED)

WORK STATION	AVAILABILITY USED FOR SIMULATION	ESTIMATED MINIMUM AVAILABILITY*
PCN	0.9906	0.6102
MFILM	0.9996	0.8152
WAND	0.9986	0.6608
WORK CELL	1.0000	0.9356
AFRS	0.9882	0.8607
SAR	1.0000	0.7874
SEAR	0.9997	0.9136
ICI	0.9972	0.9425
ICV	0.9972	0.9058
AUTOCOR	1.0000	0.9541

*AT THE INDICATED AVAILABILITY RATES, UTILIZATION WOULD REACH 1.0.



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

SIMULATION DECISIONS

- WORK CELL SIMPLIFICATION
 - WORK CELL MODELLED IN DETAIL
 - BLACK BOX REPRESENTATION IN AIDS III MODEL NECESSARY BECAUSE OF GPSS LIMITATIONS
- BATCH SIZE
 - 25 SELECTED AS BEST SIZE
 - RESPONSE TIME SCALED FOR BATCH SIZE
- WORK SHIFTS
 - SERVICE TIMES DOUBLED FOR SECOND SHIFT TO REPRESENT HALF STAFFING
- MICROFILM PROCESSING DELAY
 - NO TRANSACTIONS ENTERED IMAGE COMPARISON FUNCTION UNTIL IT HAD ACCUMULATED 159.7 min (9582 sec)
- TRANSPORTATION TIME
 - MOST OUTPUT GOES DIRECTLY TO A BELT MOVING AT 100 ft/min, TRANSPORTATION TIMES ARE NEGLIGIBLE
- OUTPUT HOPPER TIME (AVERAGE)
 - PCN - 10 min
 - CSORT - 5 min



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
COMPARISON OF WORK CELL SIMPLIFICATION METHODS**

No. OF WORK STATIONS	No. SERVERS PER WORK STATIONS	SERVICE TIME PER WORK STATION	INPUT/ OUTPUT RATE	AVERAGE TOTAL THROUGHPUT TIME	REMARKS
3	1	55 sec	60/hr	1521 sec	ORIGINAL SYSTEM FULLY MODELLED
1	1	165 sec	21/hr	2570 sec	MAXIMUM INPUT/OUTPUT GREATLY REDUCED TOTAL AVERAGE THROUGHPUT TIME GREATLY INCREASED AVERAGE QUEUE LENGTH MUCH LONGER
1	3	165 sec	60/hr	618 sec	TOTAL AVERAGE THROUGHPUT TIME GREATLY REDUCED AVERAGE QUEUE LENGTH INCORRECT
1	1	55 sec	60/hr	411*	TOTAL AVERAGE THROUGHPUT TIME GREATLY REDUCED AVERAGE QUEUE LENGTH CORRECT

* AVERAGE THROUGHPUT ADJUSTED EXTERNALLY TO THE MODEL



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
AVERAGE WAIT TIMES
(IN UNITS OF AVERAGE SERVICE TIMES)**

ρ	NUMBER OF SERVERS			
	5	10	15	20
0.4	0.02	--	--	--
0.5	0.05	0.01	--	--
0.6	0.12	0.03	0.01	--
0.7	0.25	0.07	0.03	0.02
0.8	0.55	0.21	0.11	0.06
0.9	0.76	0.67	0.40	0.28
0.95	3.5	1.7	1.1	0.76
0.98	9.5	4.6	3.0	2.3



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

AVERAGE WAIT TIME - MULTI-SERVER QUEUE

$$\text{AVERAGE WAIT TIME} = \frac{B}{M} \times \frac{T_S}{1 - \rho}$$

M = NUMBER OF SERVERS

T_S = MEAN SERVICE TIME

B = PROBABILITY THAT ALL
SERVERS ARE BUSY

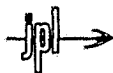
ρ = UTILIZATION = $\frac{\text{INPUT VOLUME} \times T_S}{M}$

ASSUMPTIONS:

1. POISSON ARRIVAL PATTERN
2. EXPONENTIAL SERVICE TIMES
3. ALL SERVERS EQUALLY LOADED
4. FIRST-IN, FIRST-OUT SERVICING
5. NO ITEMS LEAVE THE QUEUE EXCEPT TO BE PROCESSED

**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

ECONOMIC FEASIBILITY



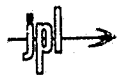
August 26, 1980



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
ECONOMIC FEASIBILITY**

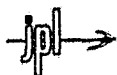
IS AIDS III ECONOMICALLY FEASIBLE?

- EVALUATE COST AND BENEFIT MEASURES FOR AID III
TIME FRAME 1980 - 2004
- COMPARE WITH THE SAME MEASURES EVALUATED FOR
THE CURRENT SYSTEM
- TEST SENSITIVITY OF THE COST AND BENEFIT MEASURES
TO CHANGES IN
 - WORK LOAD VOLUME AND MIX
 - IMPLEMENTATION SCHEDULE



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
ECONOMIC FEASIBILITY MEASURES**

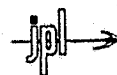
COSTS	BENEFITS	COST/BENEFIT RATIOS
LIFE CYCLE COST	RESPONSE TIME	COST PER TRANSACTION
IMPLEMENTATION COST	ACCURACY	COST PER F/P (TECH) SEARCH
ANNUAL COSTS	SATURATION VOLUME	COST PER NAME (SUBJECT) SEARCH
IMPLEMENTATION	NUMBER OF EMPLOYEES	
LABOR	EMPLOYEE SKILL MIX	
OPERATING		
PAYBACK PERIOD		
CUMULATIVE COST		



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
ECONOMIC FEASIBILITY**

SOURCES OF DATA

- AIDS III COSTS
 - ROCKWELL DOCUMENTATION
 - DISCUSSIONS WITH FBI IDENT DIVISION
- CURRENT SYSTEM COSTS
 - FBI IDENT DIVISION SUMMARY COST DATA AND BUDGETS
 - CURRENT SYSTEM EVALUATION REPORT, VOLUME V (JPL)
- SYSTEM PERFORMANCE (AIDS III, CURRENT)
 - IDENTIFICATION DIVISION DESIGN GUIDELINES (FBI)
 - SYSTEM SIMULATION (JPL)
 - SYSTEM ANALYSIS (JPL)



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
ECONOMIC FEASIBILITY
BASE CASES**

BASE CASE FOR AIDS III

- WORK CELL DESIGN CONCEPT (MAY 1980)
- IMPLEMENTATION PLAN
 - AIDS III READY 1987
 - AUTO. IMAGE RETRIEVAL READY 1990
- IMPROVED AFRS THROUGHPUT
- INCLUDES RESIDUAL MANUAL, AUTOMATION AND RESEARCH, LATENT SECTION, AND FRONT OFFICE

BASE CASE FOR CURRENT SYSTEM

- MANUAL SYSTEM WITH AIDS III
- 3450 EMPLOYEES IN 1986
- NUMBER OF EMPLOYEES NEEDED TO OPERATE AIDS II
PORTION OF CURRENT SYSTEM IS DERIVED FROM THE
AIDS III DESIGN



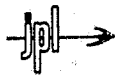
FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

ECONOMIC FEASIBILITY MEASURES
BASE CASE; DESIGN WORK LOAD 1986-2004

	LIFE CYCLE COST 1980 - 2004	IMPLEMENTATION COST 1980 - 1989	ANNUAL COST 1993	NO. OF EMPLOYEES 1993	TOTAL CUMULATIVE COSTS
AIDS III	\$553.6M	\$50.6M	\$46.9M	2398	\$1296M
CURRENT SYSTEM	\$573.5M	0*	\$58.8M	3389	\$1456M
CURRENT SYSTEM WITH EXPANDED COMPLIMENT	\$595.7M	0*	\$60.7M	3528 (1993) 3600 (1986)	\$1507M

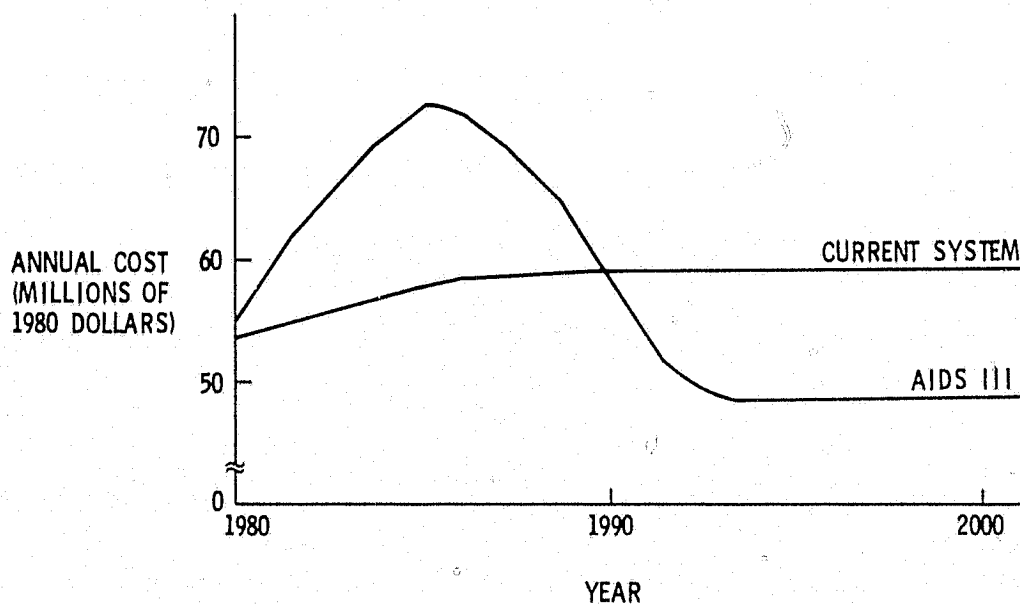
*ADDITIONAL CAPITAL EQUIPMENT MAY BE NEEDED TO MAINTAIN AND
EXPAND AIDS II THROUGH 2004.

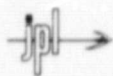
PAYBACK YEAR FOR AIDS III IS 1992



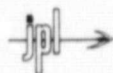
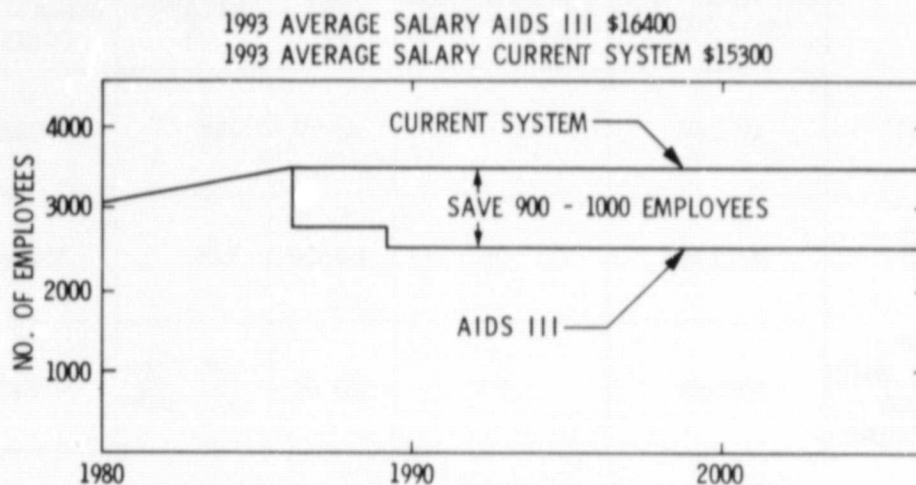
FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

ANNUAL COSTS
BASE CASE SCENARIO

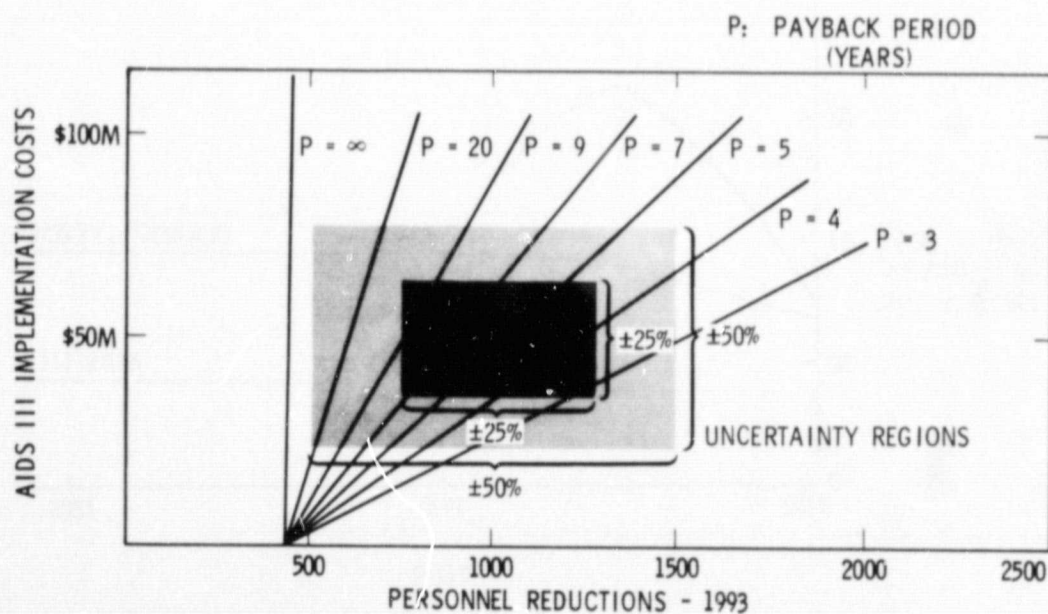


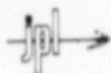


FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
NUMBER OF EMPLOYEES
BASE CASE



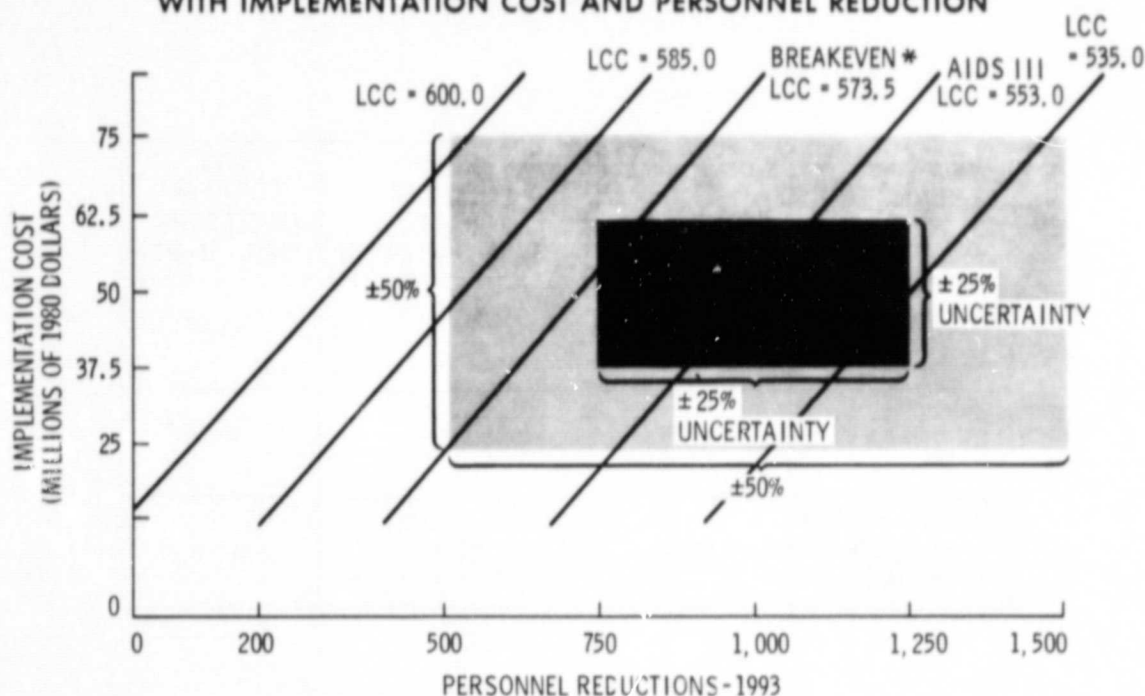
FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
VARIATION OF AIDS III UNDISCOUNTED
PAYBACK PERIOD WITH IMPLEMENTATION
COST AND PERSONNEL REDUCTIONS



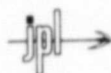


FBI FINGERPRINT IDENTIFICATION AUTOMATION STUDY

VARIATION OF AIDS III LIFE CYCLE COST WITH IMPLEMENTATION COST AND PERSONNEL REDUCTION



* The Life Cycle Cost of the Current System is estimated to be \$573.5M



FBI FINGERPRINT IDENTIFICATION AUTOMATION STUDY

COMPARISON OF PERFORMANCE BENEFITS FOR AIDS III AND CURRENT SYSTEM 1993 DESIGN WORK LOAD

	MAIL ROOM TO MAIL ROOM RESPONSE TIME (95TH PERCENTILE) WORKING HOURS	FINGERPRINT (TECH) SEARCH ACCURACY	SATURATION VOLUME
AIDS III	3 HOURS ¹	MISS RATE 5%	SMALL SUSTAINED INCREASE IN WORK LOAD WILL CAUSE UNSTABLE QUEUES
CURRENT SYSTEM - 1993 (3500 - 3700 EMPLOYEES) ²	24 HOURS	MISS RATE 24%	

1. IN 1993 20% OF THE CARDS NEED A MANUAL NAME SEARCH. THIS WILL ADD 8 - 16 HOURS TO THE RESPONSE TIME FOR THESE CARDS.
2. THE NUMBER OF EMPLOYEES NEEDED TO OPERATE CURRENT SYSTEM - 1993 TO ACHIEVE A 24 HOUR RESPONSE TIME DEPENDS ON SUBSYSTEM UTILIZATIONS DESIRED. STAFFING RESULT IN UTILIZATIONS BETWEEN 0.90 (FOR 3700 EMPLOYEES) TO 1.0 (FOR 3500).



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
COST/BENEFIT RATIOS

	1993 COST PER TRANSACTION (DOCS + CARDS)	1993 COST PER NAME (SUBJECT) SEARCH	1993 COST PER FINGERPRINT (TECH) SEARCH
AIDS III	\$4.35	\$1.13	\$3.67
CURRENT SYSTEM	\$5.45	\$1.13	\$7.76
CURRENT SYSTEM (EXPANDED COMPLIMENT)	\$5.63	\$1.16	\$8.26



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
REQUIRED STAFFING AND RESPONSE TIMES
(95TH PERCENTILE) FOR AIDS III AND CURRENT SYSTEMS

PROJECTED WORK LOADS	SYSTEM SIZE	DAILY FP CARDS*	YEAR	AIDS III		CURRENT	
				EMPL	RESP TIME	EMPL	RESP TIME
BASE CASE	ENHANCED	~ 27,600	1993	2388	2.9	3748	24.8
CONSTANT GROWTH	ENHANCED	~ 31,000	1993	2650	2.8	4174	24.8
	ENHANCED	~ 37,300	2004	3163	2.9	5009	24.9
MIXED GROWTH	ENHANCED	~ 35,000	1993	3085	3.0	***	
	ENHANCED	~ 42,000	2004	3563	3.2	***	
III IMPLEMENTED	ENHANCED	~ 29,000	1993	2584	3.1	3748	**
0.8 BASE WORK LOAD	BASE CASE	~ 22,100	1993	2388	2.8	3748	24.6
1.2 BASE WORK LOAD	BASE CASE	~ 33,100	1993	2388	**	3748	**
0.8 BASE WORK LOAD	RESCALED	~ 22,100	1993	2051	2.9	3180	24.9
1.2 BASE WORK LOAD	RESCALED	~ 33,100	1993	2797	2.9	4464	24.9

* DOES NOT INCLUDE RESIDENT ALIEN CARDS

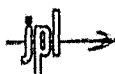
** SYSTEM OVERLOADED AND UNSTABLE

*** RESULTS IN PREPARATION



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
SENSITIVITY TO CHANGES
IN IMPLEMENTATION SCHEDULE

	AIDS III WITH MANUAL IMAGE RETRIEVAL	AIDS III WITH AUTOMATIC IMAGE RETRIEVAL	LIFE CYCLE COST OF AIDS III	PAYBACK YEAR
EARLY SCHEDULE	1985	1985	\$547.2M	1989
ROCKWELL MAY 1980 PROPOSED SCHEDULE	1987	1990	\$553.6M	1991
LATE SCHEDULE	1989	1992	\$564.9M	1993



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

COST DATA ANALYSIS

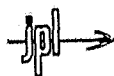


August 27, 1980



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
AIDS III — CURRENT SYSTEM: COST ANALYSIS MODEL

READ INPUT
CALCULATE ANNUAL LABOR COUNTS
CALCULATE ANNUAL LABOR COST
CALCULATE ANNUAL OPERATING COST
CALCULATE TOTAL ANNUAL COST
CALCULATE CUMULATIVE ANNUAL COST
CALCULATE ANNUAL DIFFERENCES
CALCULATE LIFE CYCLE COST
CALCULATE VARIOUS RATIOS
WRITE OUT RESULTS



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
CALCULATE ANNUAL LABOR COUNTS
BASE CASE ASSUMPTIONS

INITIAL 1980 LABOR COUNTS	FRONT OFFICE LATENT PRINTS AUTOMATION AND RESEARCH	FINGERPRINT SEARCH MANUAL AND AUTOMATED	NAME SEARCH AND RESPONSE GENER- ATION MANUAL AND AUTOMATED
APPLICANT PORTION	AVERAGE	67%	35%
CRIMINAL PORTION		33%	65%

APPLICANT ESCALATION RATES

1.7% THROUGH 1986
0.0% 1987 - 2004

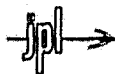
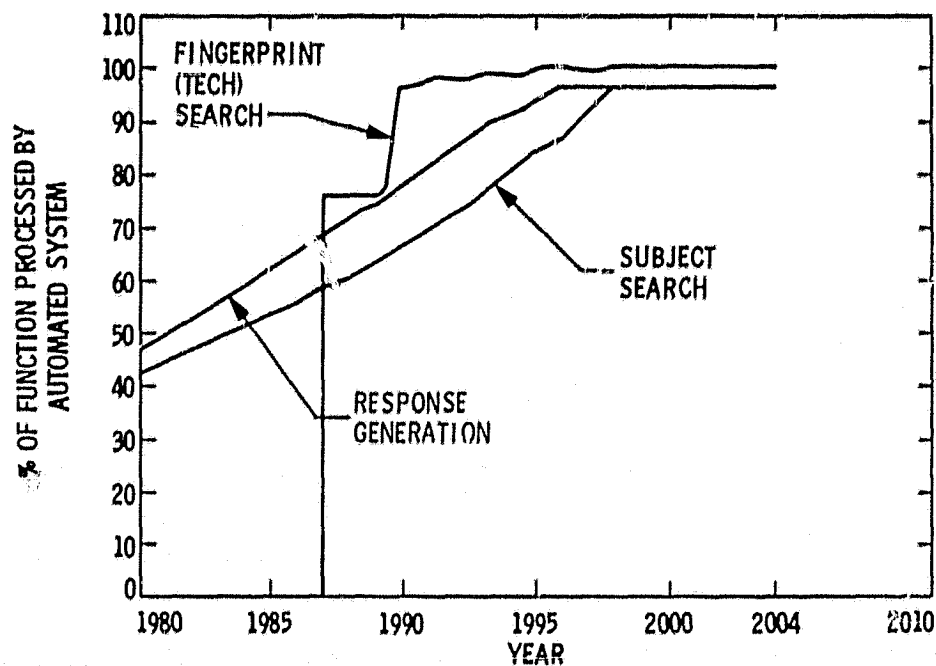
CRIMINAL ESCALATION RATES

1.7% THROUGH 1986
0.0% 1987 - 2004

AUTOMATION INDICES (WEIGHTED AVERAGES) ARE USED TO
DETERMINE MANUAL TO AUTOMATED MIX



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
AUTOMATION INDICES**

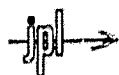
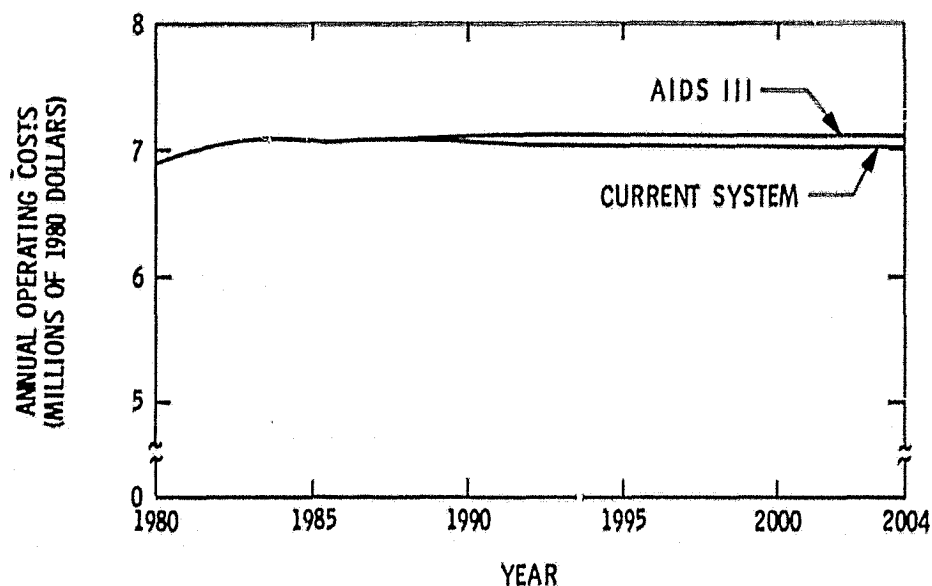


**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
CALCULATE ANNUAL LABOR COST**

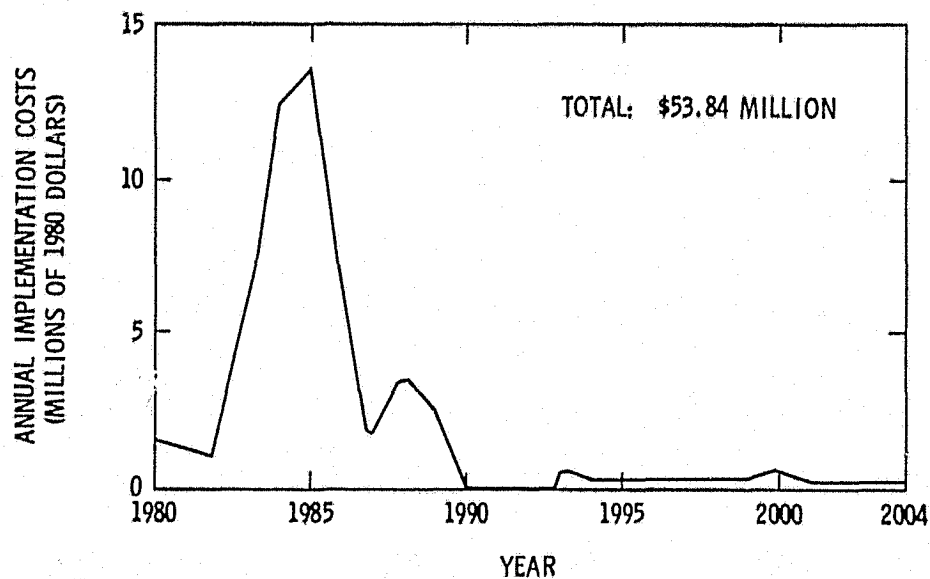
● FRONT OFFICE LABOR COUNT	X	\$ 14,934
● LATENT PRINTS LABOR COUNT	X	\$ 24,519
● AUTOMATION AND RESEARCH LABOR COUNT	X	\$ 19,746
● FINGERPRINT (TECHNICAL) SEARCH, NAME SEARCH, AND RESPONSE GENERATION LABOR COUNTS		
● MANUAL PORTION	X	\$ 13,903
● AUTOMATED PORTION	X	\$ 15,969

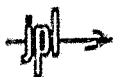


FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
ANNUAL OPERATING COSTS
BASE CASE

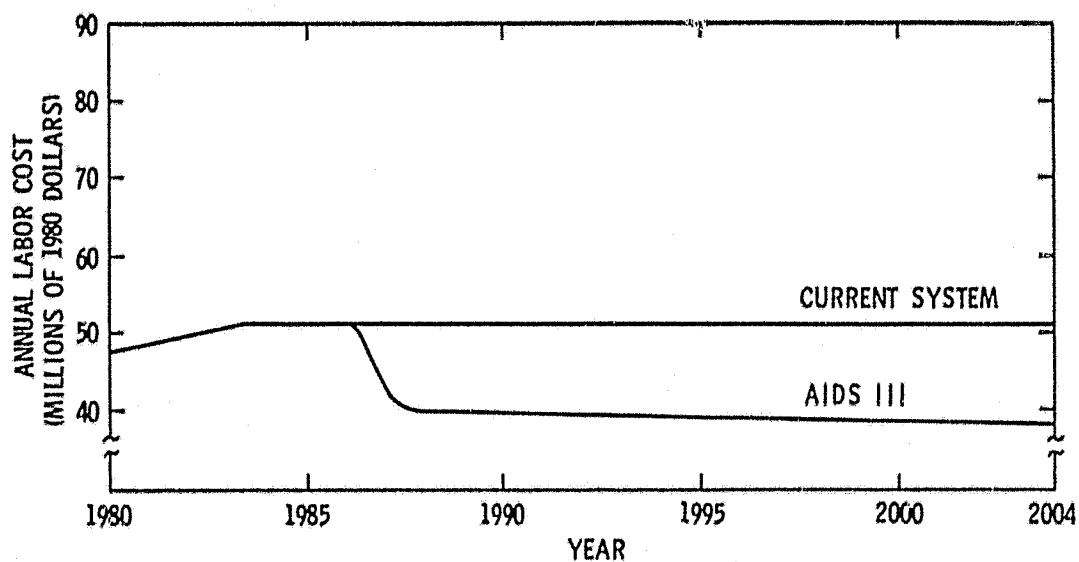


FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
BASE CASE

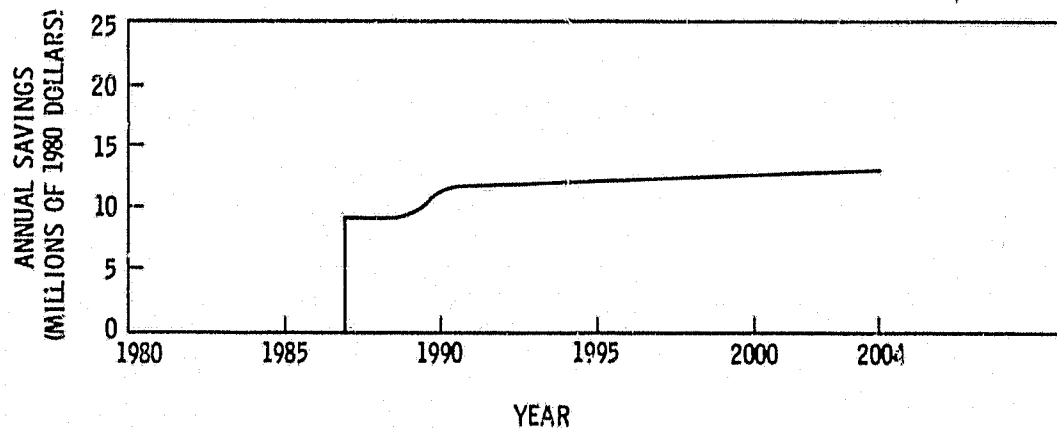




FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
ANNUAL LABOR COSTS
BASE CASE

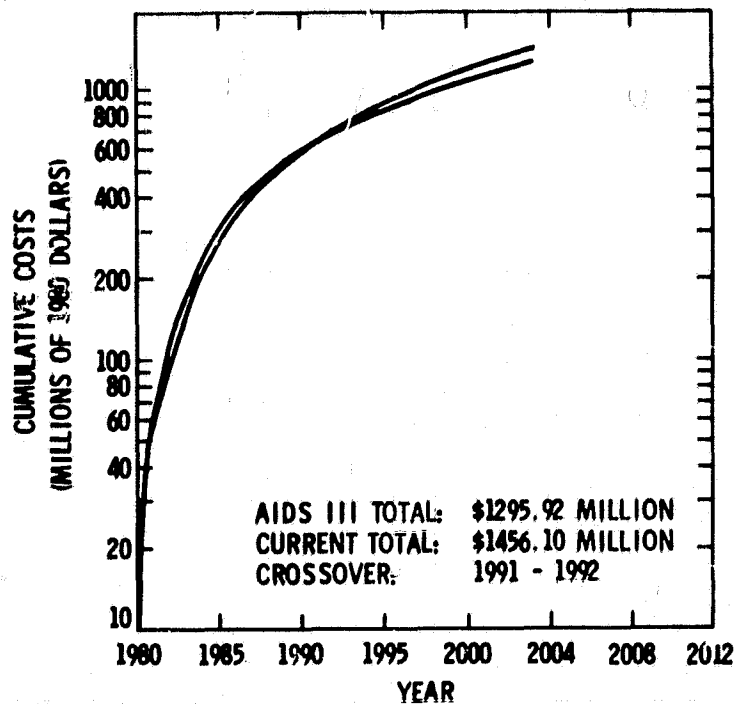


FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
ANNUAL LABOR COST SAVINGS
WITH AIDS III IMPLEMENTATION
BASE CASE





**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
TOTAL CUMULATIVE COSTS
BASE CASE**



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
LIFE CYCLE-COSTS
(Millions of 1980 Dollars)**

WORKLOAD PROJECTION SYSTEM	BASE CASE SCENARIO #4	1.7% CONSTANT GROWTH SCENARIO #1	MIXED GROWTH RATES SCENARIO #1 & 2	INTERSTATE IDENTIFICATION INDEX (III) SCENARIO #2 & 5	AUTOMATION OF FBI IDENTIFICATION SCENARIO #3
AIDS III	553.6	579.0	621.3	566.9	566.7
CURRENT SYSTEM	573.5	605.2	658.5	592.2	593.5

**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

**COST AND BENEFIT MEASURES
FOR FINGERPRINT
IDENTIFICATION SYSTEMS**



August 27, 1980



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

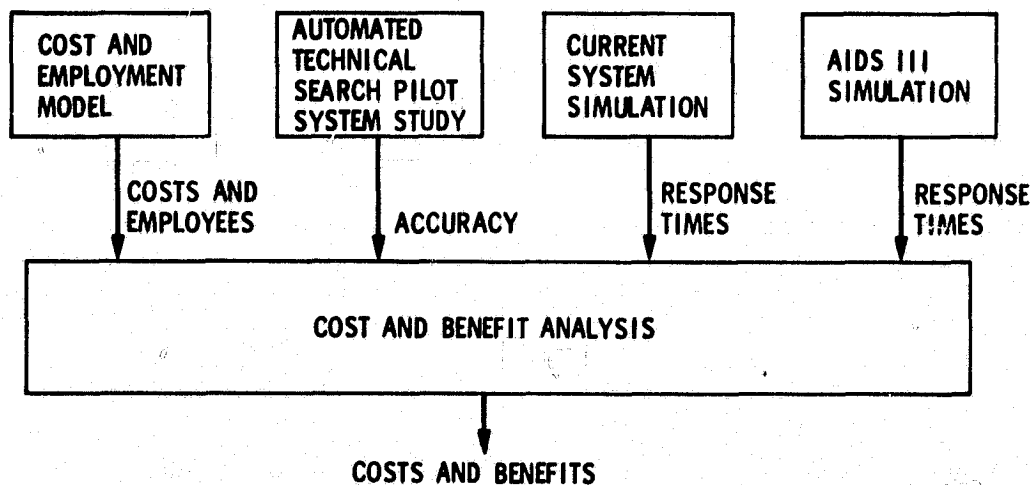
ECONOMIC FEASIBILITY

● **PRESENTATION OF COST AND BENEFIT MEASURES**

- **METHODOLOGY**
- **RESULTS**
 - **VARIATION OVER TIME**
 - **VARIATION WITH WORK LOAD**
 - **SELECTED COST/BENEFIT RATIOS**
 - **DIFFERENCES IN MEASURES BETWEEN THE CURRENT AND AIDS III SYSTEMS**



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
METHODOLOGY FOR COST
AND BENEFIT MEASURES**





**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
INDIVIDUAL MEASURES - COSTS**

- LIFE CYCLE COST
- ANNUAL OPERATING COST
- ANNUAL IMPLEMENTATION COST
- ANNUAL LABOR COST
- TOTAL ANNUAL COST
- TOTAL IMPLEMENTATION COST
- CUMULATIVE COST



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
INDIVIDUAL MEASURES - PERFORMANCE
AND EMPLOYMENT**

- PERFORMANCE
 - ACCURACY
 - RESPONSE TIME
 - SATURATION VOLUME
- EMPLOYMENT
 - NUMBER OF EMPLOYEES
 - SKILL MIX



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
**ACCURACY COMPARISON BASED ON AUTOMATED
TECHNICAL SEARCH PILOT SYSTEM STUDY
FOR BASE CASE WORK LOAD**

	CURRENT		AIDS III	
	APPLICANT	CRIMINAL	APPLICANT	CRIMINAL
COMPARATIVE FIND RATES	60%	81%	96%	94%
FP CARD DAILY VOLUME	11,600	13,800	11,600	13,800
NUMBER OF FINGERPRINT (TECHNICAL) SEARCHES	8,350	3,725	8,350	3,725
NUMBER IN FILE (APPROX)	200	500	200	500
NUMBER FOUND	120	405	192	470



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
**REQUIRED STAFFING AND RESPONSE TIMES
(95TH PERCENTILE) FOR AIDS III AND CURRENT SYSTEMS**

PROJECTED WORK LOADS	SYSTEM SIZE	DAILY FP CARDS*	YEAR	AIDS III		CURRENT	
				EMPL	RESP TIME	EMPL	RESP TIME
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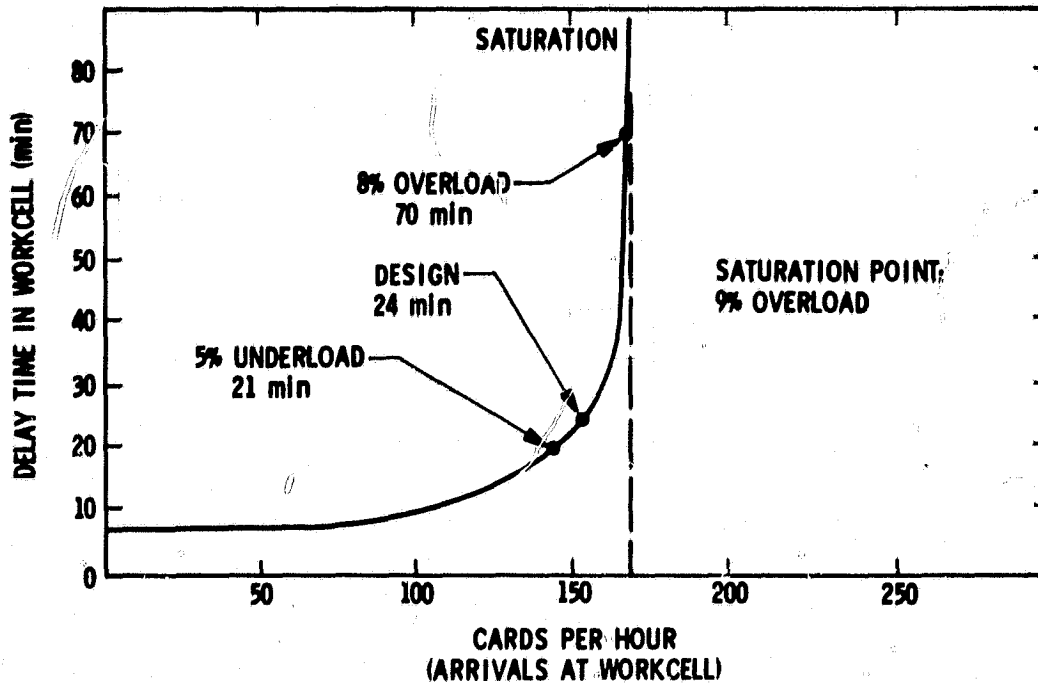
* DOES NOT INCLUDE RESIDENT ALIEN CARDS

** SYSTEM OVERLOADED AND UNSTABLE

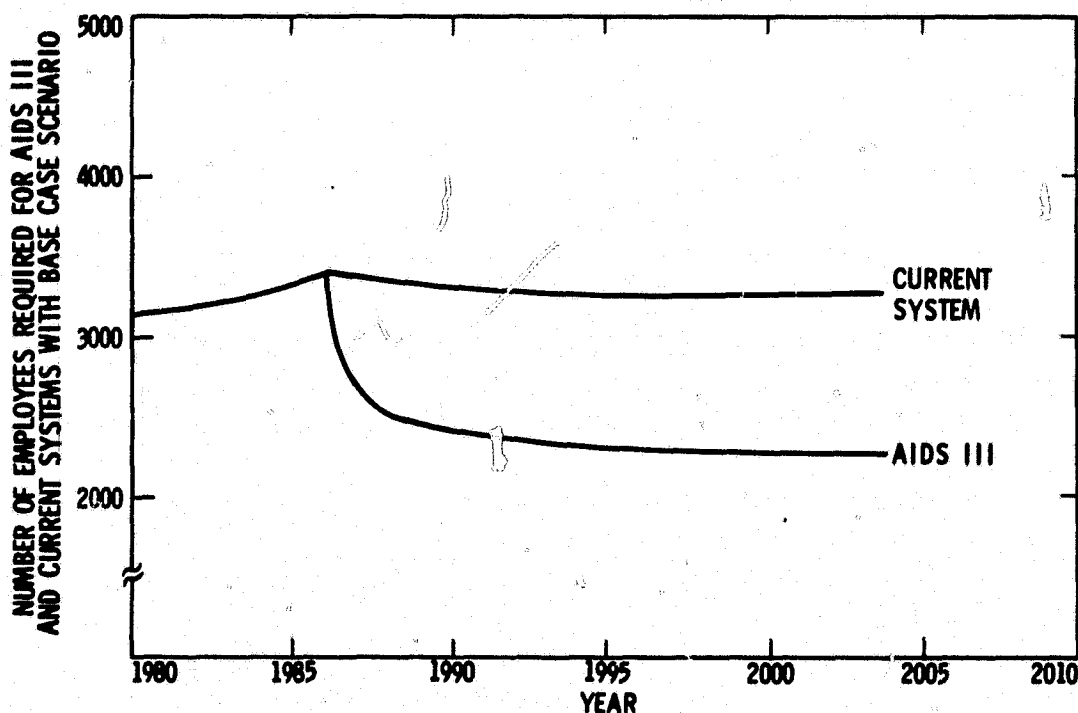
*** RESULTS IN PREPARATION



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
DELAY TIME IN WORK CELL VS
WORK LOAD ARRIVALS AT RATE
AIDS III SYSTEM DESIGN



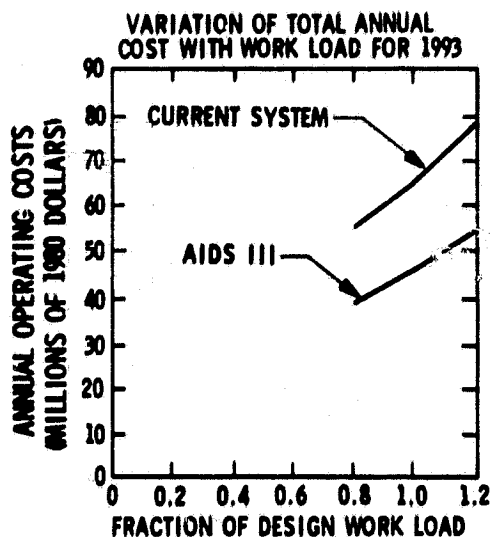
FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
NUMBER OF EMPLOYEES REQUIRED FOR AIDS III AND
CURRENT SYSTEMS WITH BASE CASE SCENARIO





FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

**VARIATION OF COSTS WITH WORK LOAD ASSUMING
RESPONSE TIME HELD ABOUT THE SAME**



VARIATION OF TOTAL
ANNUAL COST WITH WORK LOAD

WORK LOAD (% OF BASE CASE)	TOTAL ANNUAL COST (IN MILLIONS OF 1980 DOLLARS)		
	CURRENT	AIDS III	DIFFERENCE
80%	55.2	39.6	15.6
100%	65.0	46.1	18.9
120%	77.5	54.0	23.5

- SYSTEM RESCALED
- WORK LOADS VARIED: $\pm 20\%$ FROM DESIGN WORK LOAD



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

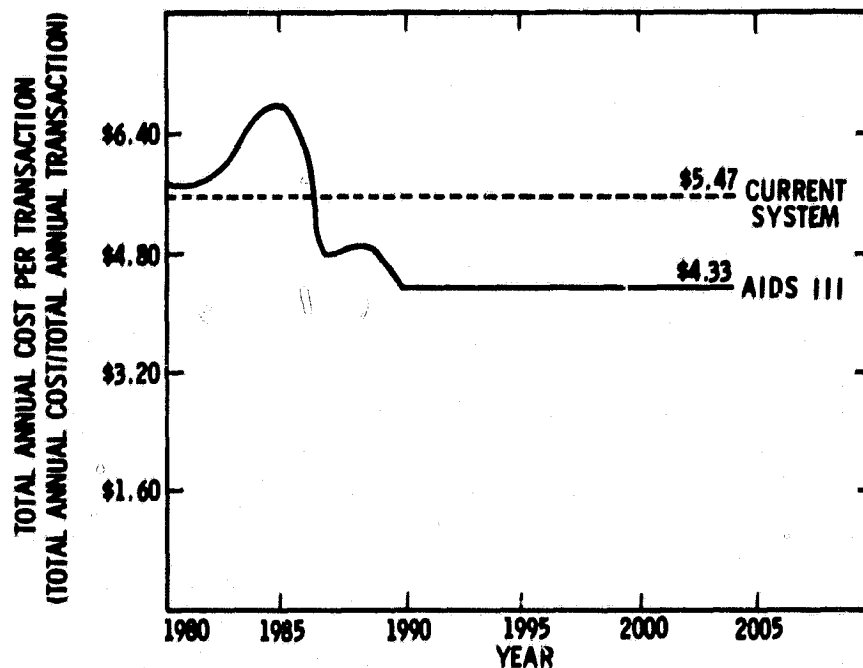
SELECTED COST/BENEFIT RATIOS

- TOTAL ANNUAL COST PER NUMBER OF TRANSACTIONS PER YEAR
(TOTAL ANNUAL COST PER TRANSACTION)
- COST OF TECH. SEARCH PER NUMBER OF TECH. SEARCHES PER YEAR
(COST PER TECH. SEARCH)
- COST OF SUBJECT SEARCH PER NUMBER OF SUBJECT SEARCHES PER YEAR
(COST PER SUBJECT SEARCH)
- CUMULATIVE COST PER CUMULATIVE NUMBER OF TRANSACTIONS
(CUMULATIVE COST PER TRANSACTION)



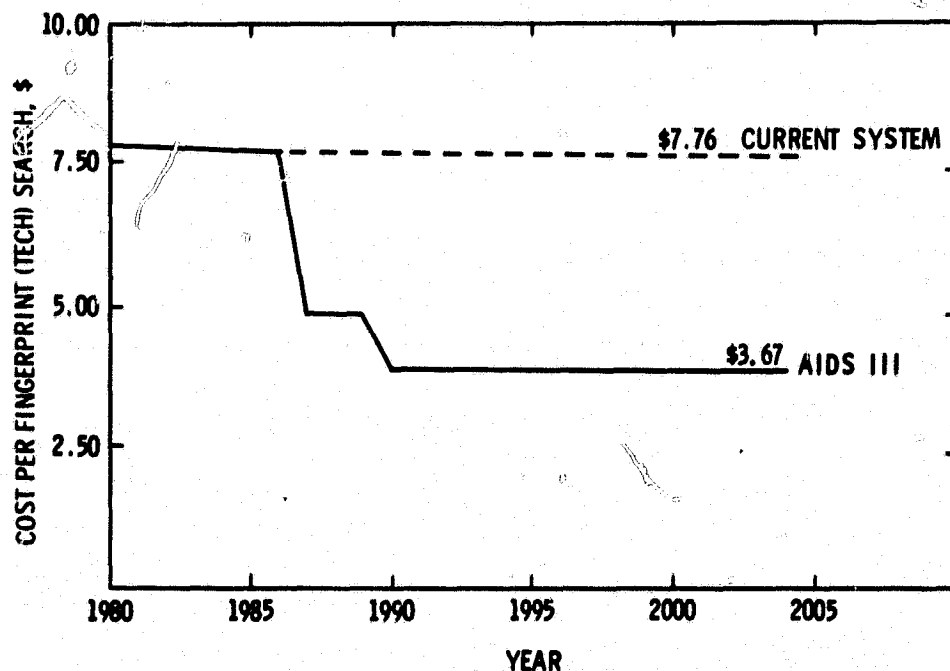
FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

TOTAL ANNUAL COST PER TRANSACTION OVER TIME WITH BASE
CASE OF 1.7% GROWTH TO 1986, ZERO AFTERWARD



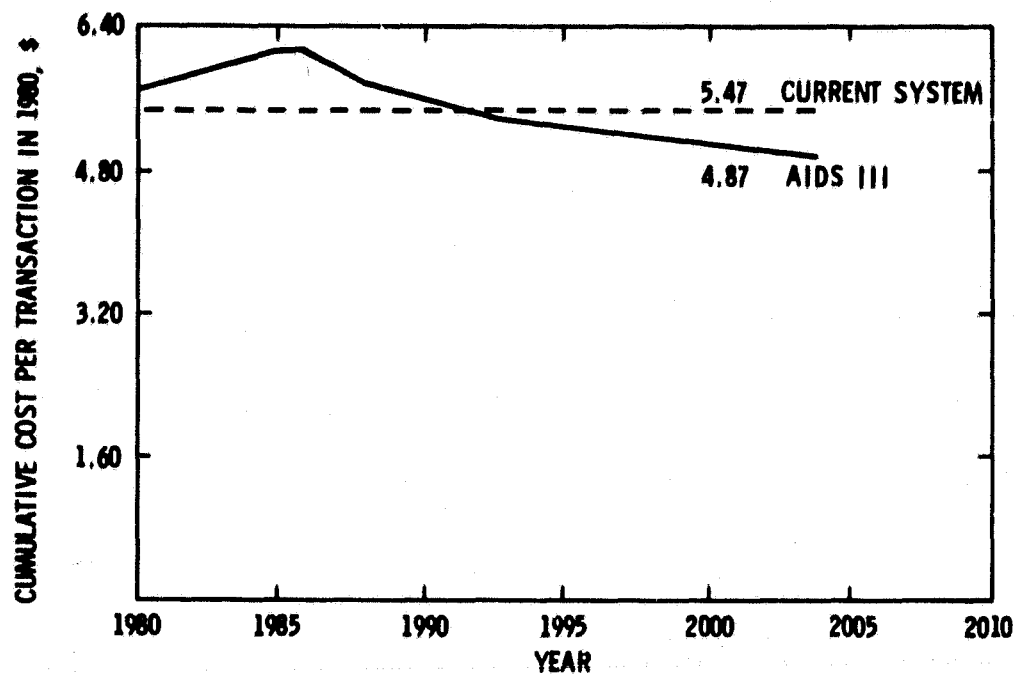
FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

COST PER F/P (TECH) SEARCH 1980-2004 WITH BASE CASE





FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
**CUMULATIVE COST PER TRANSACTION
1980-2004 FOR BASE CASE**

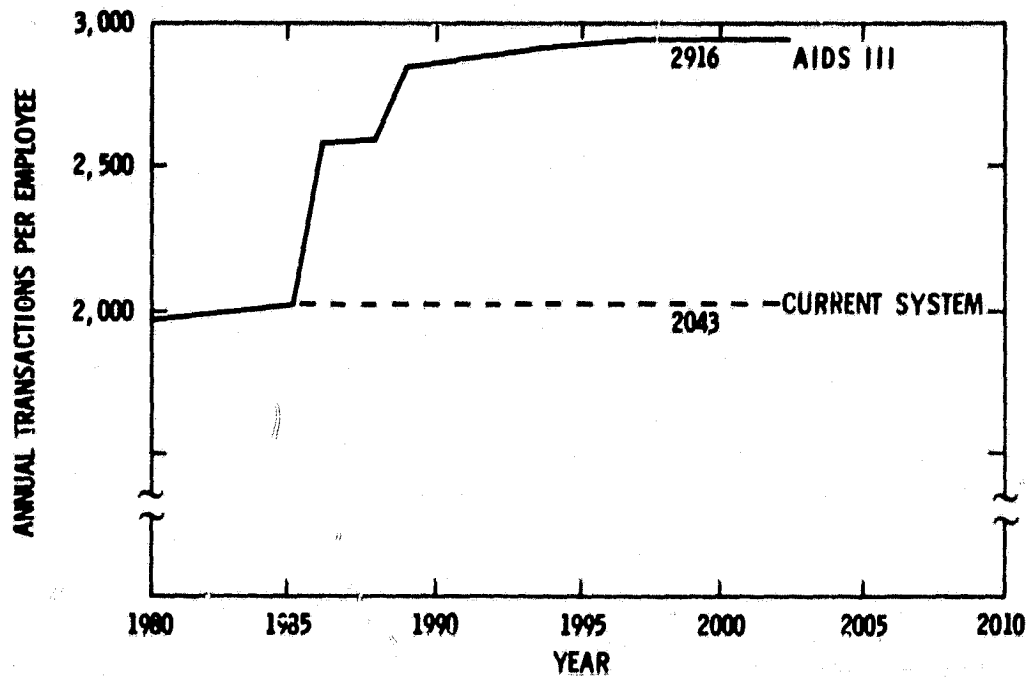


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AUTOMATION STUDY
SELECTED OTHER RATIOS

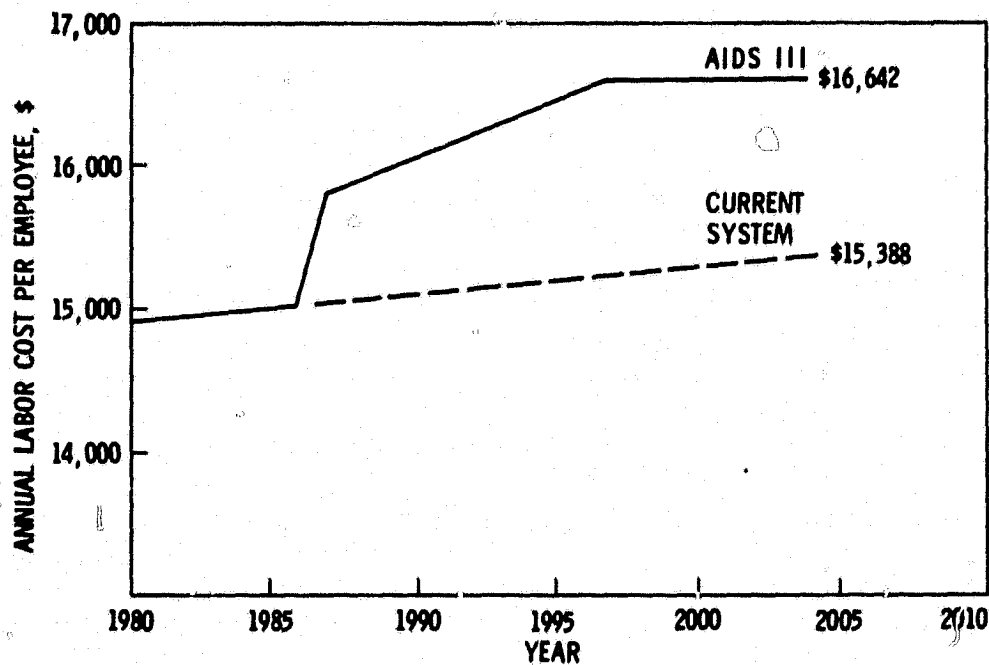
- TOTAL TRANSACTIONS PER YEAR PER TOTAL NUMBER OF EMPLOYEES
(MEASURES PRODUCTIVITY)
- ANNUAL LABOR COST PER TOTAL NUMBER OF EMPLOYEES
(MEASURES LABOR COST AND REFLECTS SKILL MIX)
- TOTAL ANNUAL COST PER TOTAL NUMBER OF EMPLOYEES



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
APPROXIMATE ANNUAL TRANSACTIONS PER EMPLOYEE
1980-2004 FOR ALL FIVE CASES

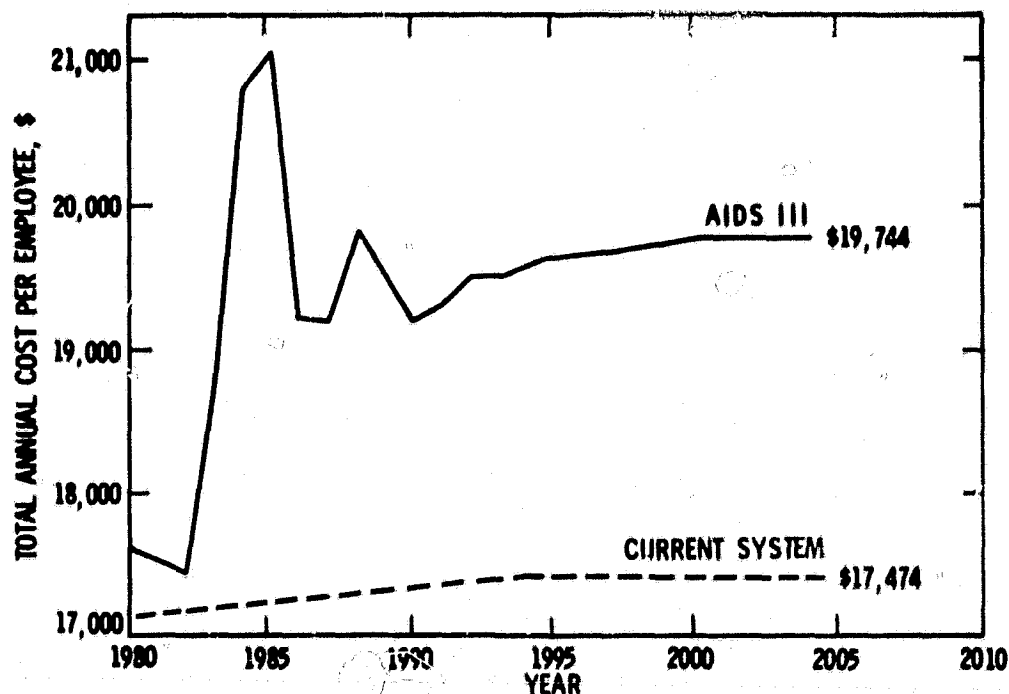


FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
APPROXIMATE ANNUAL LABOR COST
PER EMPLOYEE 1980-2004 FOR ALL FIVE CASES





**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
TOTAL ANNUAL COST PER EMPLOYEE 1980 -2004
FOR BASE CASE (OTHER SCENARIOS SIMILAR)**



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
DIFFERENCES BETWEEN AIDS III AND CURRENT SYSTEM
IN TERMS OF BENEFIT AND EMPLOYMENT MEASURES**

- DIFFERENCES IN BENEFIT MEASURES
 - ACCURACY
 - RESPONSE TIME
- DIFFERENCES IN EMPLOYMENT MEASURES
 - DIFFERENCES IN NUMBER OF EMPLOYEES
 - DIFFERENCES IN SKILL MIX

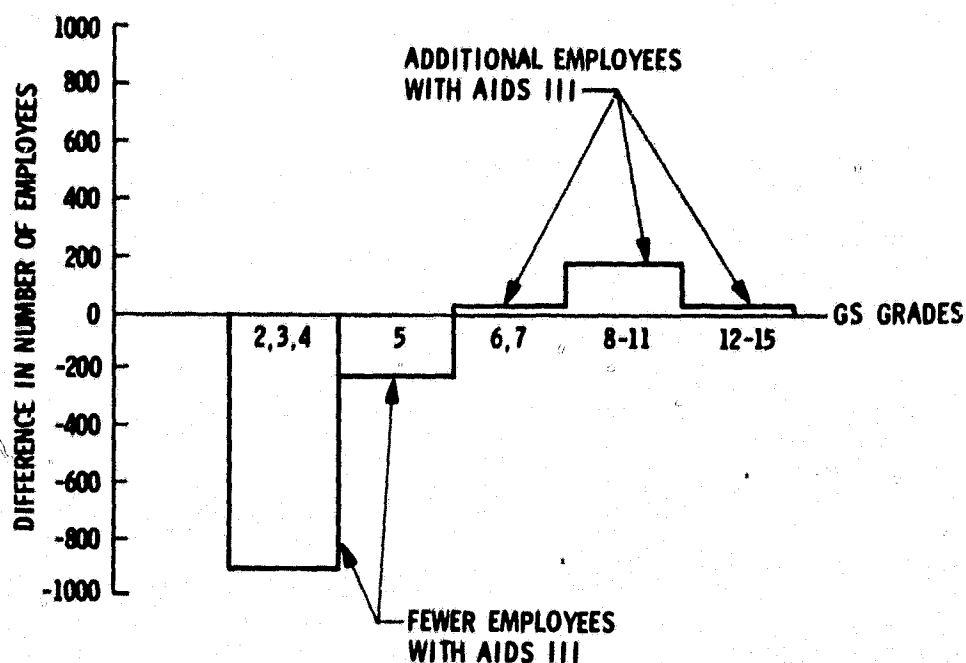


**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
DIFFERENCE IN BENEFIT MEASURES
BETWEEN AIDS III AND THE CURRENT SYSTEM**

MEASURE	CURRENT SYSTEM	AIDS III	DIFFERENCE
ACCURACY (F/P SEARCH MISS RATE)	~25%	~5%	-20%
MAIL ROOM TO MAIL ROOM RESPONSE TIME (95th PERCENTILE)	~25 hours	~3.0 hours	-22 hours
NUMBER OF EMPLOYEES	~3500 TO 3700	~2400	-1,100 TO -1,300

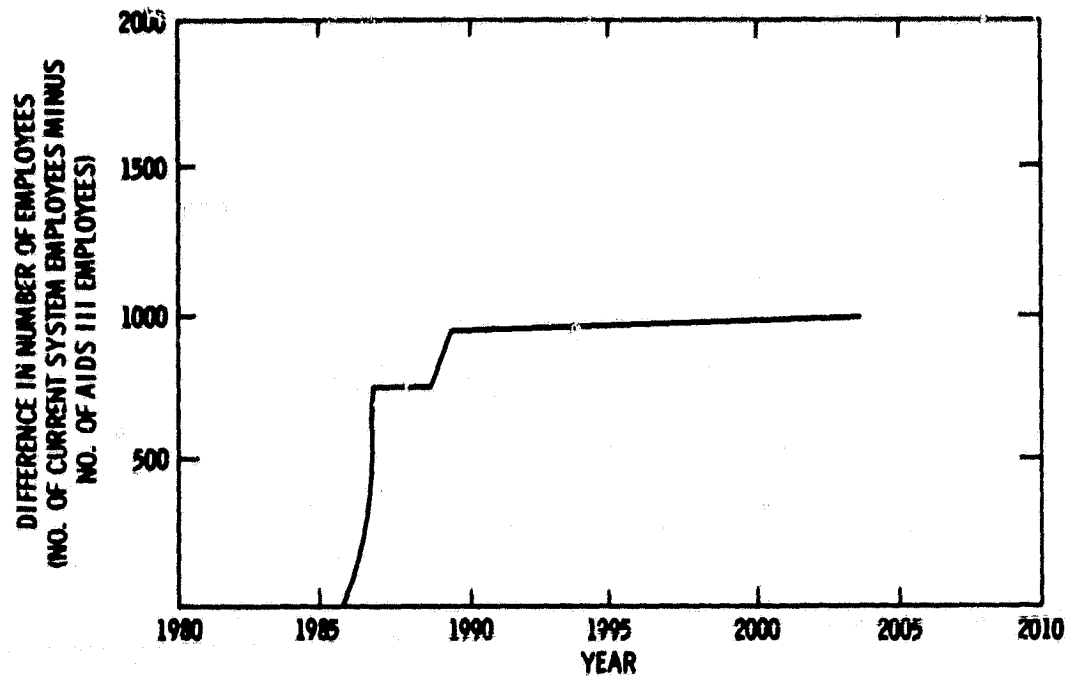


**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
DIFFERENCE IN SKILL MIX BETWEEN AIDS III AND
CURRENT SYSTEM FOR 1986 WITH DESIGN WORK LOAD**

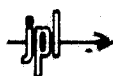




**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
EMPLOYEES SAVED WITH AIDS III VERSUS
CURRENT SYSTEM WITH BASE CASE SCENARIO**



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**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

ENVIRONMENTAL ANALYSIS



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

QUANTITATIVE DESCRIPTION OF THE WORK LOAD

● **DISTRIBUTION OF SUBMISSIONS:**

- **APPLICANT VS CRIMINAL**
- **STATE AGENCIES, FEDERAL AGENCIES**

● **DISTRIBUTION OF ACTIVITIES BY TYPE OF SUBMISSIONS**



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

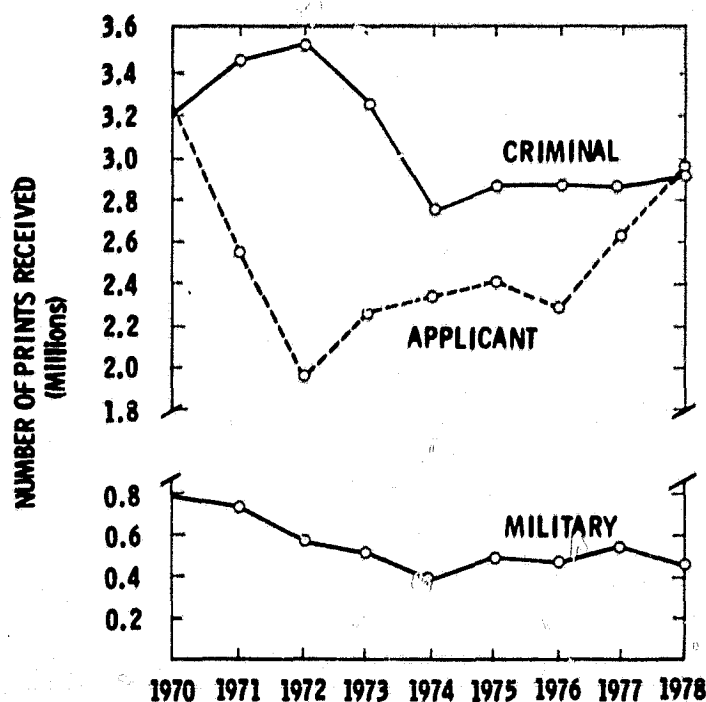
CHARACTERISTICS OF STATE CRIMINAL AND APPLICANT SUBMISSIONS

- **NUMBERS AND RATES OF SUBMISSIONS NOT ENTIRELY DETERMINED
BY STATE POPULATIONS**
- **CRIME RATES EXPLAIN ONLY 50% OF VARIANCE OF CRIMINAL SUBMISSIONS**
- **RATES OF SUBMISSIONS VARY OVER TIME FOR INDIVIDUAL STATES**



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

TOTAL FINGERPRINTS RECEIVED BY THE IDENTIFICATION DIVISION



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

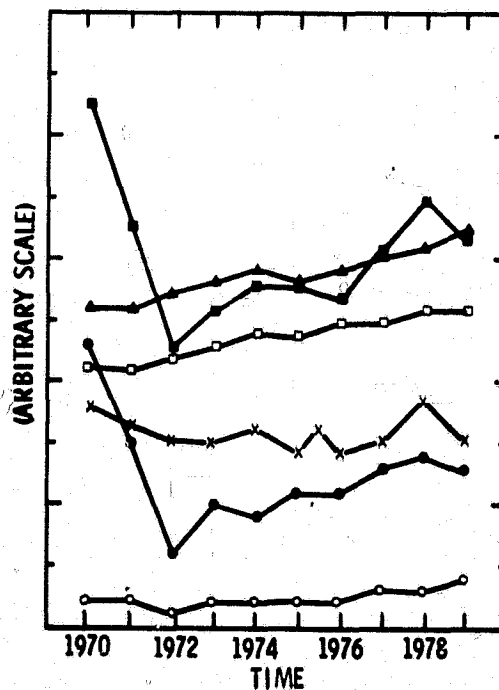
APPLICANT SUBMISSIONS AND EMPLOYMENT

APPLICANT SUBMISSIONS

- LAW ENFORCEMENT
- FEDERAL GOVERNMENT
- ▲ BANKING
- × TOTAL

EMPLOYMENT

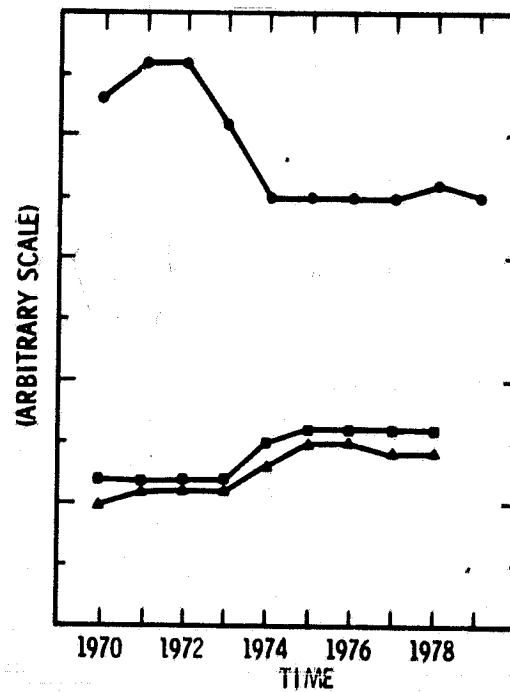
- TOTAL
- FEDERAL



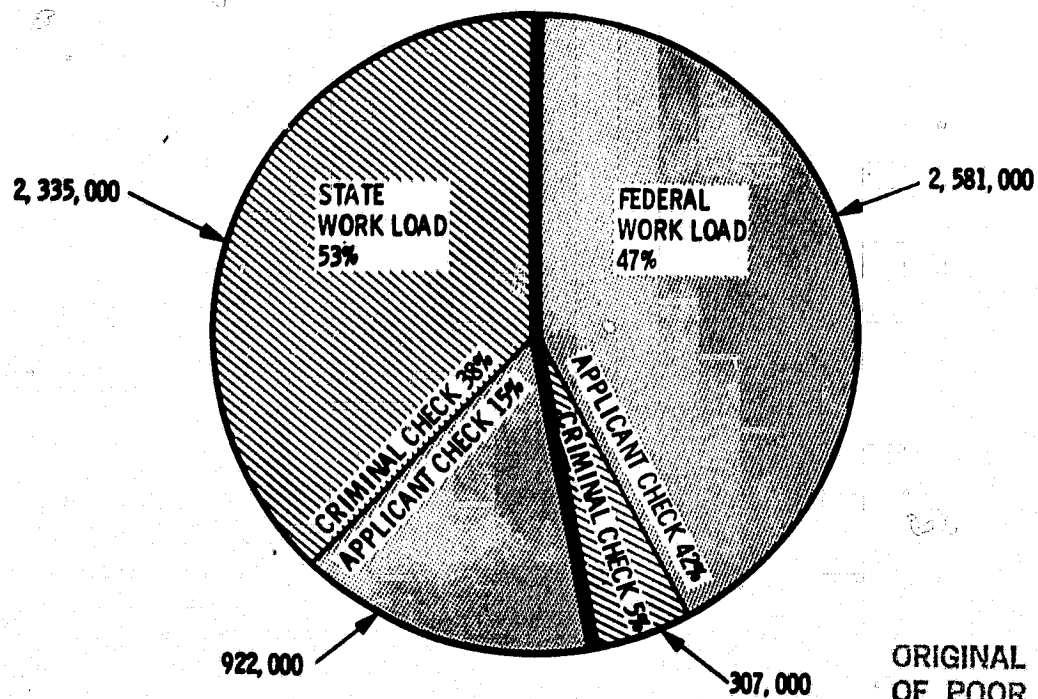


FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
CRIME STATISTICS

- CRIMINAL SUBMISSIONS
- UNIFORM CRIME REPORTS
- ▲ CRIMES AGAINST PROPERTY



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
TOTAL ID ACTIVITY BY SOURCE (FY 1979)



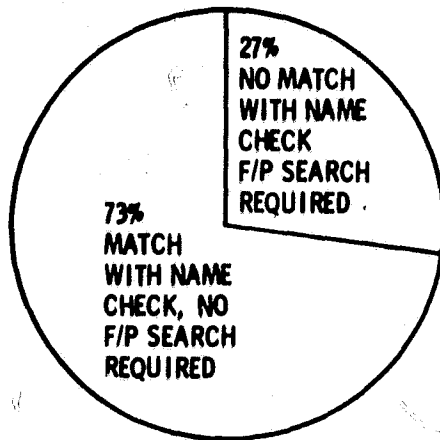
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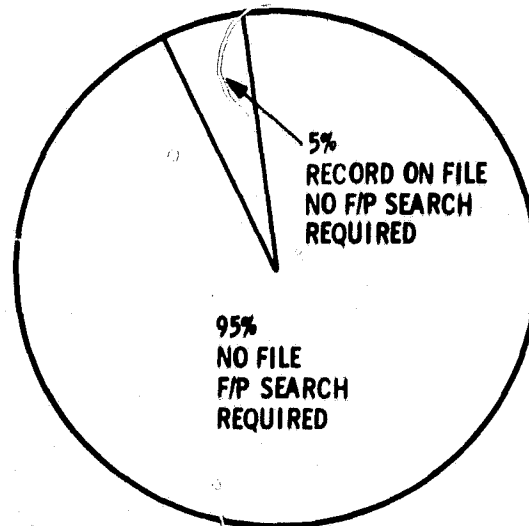
**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

BREAKDOWN OF SUBMISSIONS WORK LOAD

CRIMINAL SUBMISSIONS 43%



APPLICANT SUBMISSIONS 57%



**% OF TOTAL SUBMISSIONS
TO IDENTIFICATION DIVISION**



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

CHARACTERISTICS OF USERS AND USER ENVIRONMENT

- PATTERNS OF USE IN STATES VARY WIDELY
- DETERMINANTS OF STATE SUBMISSIONS ARE COMPLEX AND DIFFUSE
- STATE SUBMISSIONS ARE VOLUNTARY AND IDIOSYNCRATIC



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

**CHARACTERISTICS OF THE WORK LOAD DETERMINED BY USERS:
THE INTERNAL MODEL**

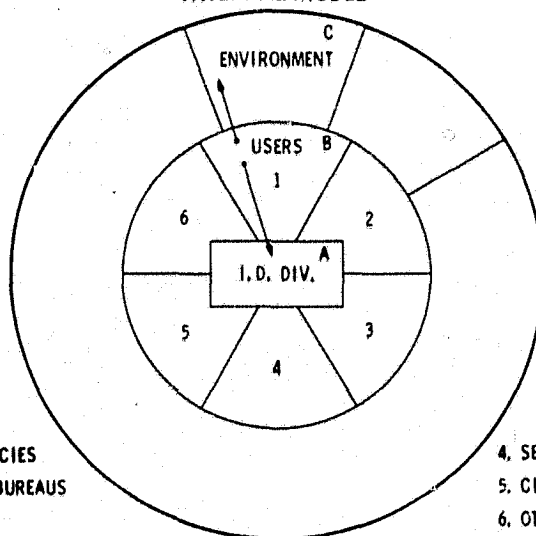
- EXISTING WORK LOAD ANALYZED IN TERMS OF RESPONSE TO USERS
- USER NEEDS DETERMINED BY EXTERNAL ENVIRONMENT:
 - STATUTORY, LEGISLATIVE REQUIREMENTS ON IDENTIFICATION
 - CENTRALIZED CRIMINAL INFORMATION SERVICES
 - TRANSIENT IMPULSES IN THE IDENTIFICATION SYSTEM
- CONGRUENCE OF IDENTIFICATION DIVISION SERVICES WITH USER NEEDS



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

**DIAGRAM OF INTERNAL MODEL
I.D. AND RECORD KEEPING ENVIRONMENT**

INTERNAL MODEL



- 1. LAW ENFORCEMENT AGENCIES
- 2. STATE IDENTIFICATION BUREAUS
- 3. NATIONAL BANKS

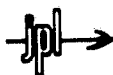
- 4. SECURITIES FIRMS
- 5. CIVIL SERVICE COMMISSION
- 6. OTHER GOVERNMENT AGENCIES

MODEL OF INTERNAL ENVIRONMENT VIEWPOINT



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
DRIVERS AND EFFECTS**

TYPE OF DRIVER	DIRECTION OF INDUCED CHANGE IN WORK LOAD				UPPER (LOWER) BOUND OF EFFECTS	COMMENTS
	RECORD KEEPING	F.P. SEARCH	CRIMINAL SUBMISSIONS	APPLICANT SUBMISSIONS		
ECONOMIC TRENDS						
STAGNANT ECONOMY		—	+	—	PRESENT RATE OF GROWTH MAINTAINED (1.7% PER ANNUM); UPPER BOUND	
FISCAL CONSTRAINTS: FEDERAL						
HIRING FREEZE	—	—		—	-1 MILLION; LOWER BOUND	
REDUCTION IN LEAA FUNDS	+	+	+		VARIES BY STATE	LEAA APPROPRIATIONS CUT-OFF IN PROCESS; SEE TEXT
FEES FOR APPLICANT SERVICES OF IDENT. DIVSN.	—	—	—	—	-1 MILLION; LOWER BOUND	VARIES STATE TO STATE
TIGHTER CRITERIA FOR SUBMISSIONS	—	—	—	—	-0.7 MILLION; LOWER BOUND	
FISCAL CONSTRAINTS: STATE						
HIRING FREEZE	—	—		—	-1 MILLION; LOWER BOUND	
REDUCED FUNDS FOR IN-STATE I.D.	+		+		VARIES BY STATE	SEE TEXT



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
DRIVERS AND EFFECTS (Cont'd)**

TYPE OF DRIVER	DIRECTION OF INDUCED CHANGE IN WORK LOAD				UPPER (LOWER) BOUND OF EFFECTS	COMMENTS
	RECORD KEEPING	F.P. SEARCH	CRIMINAL SUBMISSIONS	APPLICANT SUBMISSIONS		
DEMOGRAPHIC TRENDS						
INCREASE IN MEDIAN AGE	—	—	—	—	REDUCTION IN ALL ACTIVITIES 0.5% PER ANNUM; LOWER BOUND	
SLOWER GROWTH OF POP.	—	—	—	—	REDUCTION IN ALL ACTIVITIES 1% PER ANNUM; LOWER BOUND	
MOBILITY DECLINE					DATA DO NOT PERMIT PROJECTION	SEE TEXT
LEGISLATIVE/JUDICIAL ACTIONS						
TRENDS IN POLITICAL CONCERNS						
PRIVACY OF PERSONAL INFORMATION	+					
FREEDOM OF INFORMATION	+				+ 15,000 PER ANNUM; UPPER BOUND	
SPEEDY DISPOSITION OF CRIMINAL CHARGES	—	—	—		VARIES BY STATE	SEE TEXT
DECRIMINALIZATION OF VICTIMLESS CRIMES	—	—	—	+	EFFECTS NEGLIGIBLE	SEE TEXT
LEGALIZATION OF CASINO GAMBLING	+	+	+	+	NOT ESTIMATED	SEE TEXT



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

DRIVERS AND EFFECTS (Cont'd)

TYPE OF DRIVER	DIRECTION OF INDUCED CHANGE IN WORK LOAD				UPPER (LOWER) BOUND OF EFFECTS	COMMENTS
	RECORD KEEPING	F.P. SEARCH	CRIMINAL SUBMISSIONS	APPLICANT SUBMISSIONS		
LEGISLATIVE/JUDICIAL ACTIONS (CONT)						
ANTICIPATED LEGISLATIVE/ JUDICIAL ACTIONS						
INCREASED IMMIGRATION QUOTA	+	+		+	+350,000 APPLICANT SUBMISSIONS/YEAR	SEE TEXT
INCLUSION OF WOMEN IN DRAFT	+	+		+	NOT ESTIMATED	
INCREASE IN FOREIGN WORKERS	+	+		+	+65,000 APPLICANT SUBMISSIONS/YEAR	
POSSIBLE LEGISLATIVE ACTIONS						
NATIONAL GUN REGISTRATION	+	+	-	+	+2 MILLION PER ANNUM; UPPER BOUND	100 MILLION 'FIRST YEAR' REGISTRANTS, NEW AGENCY LIKELY
NATIONAL I.D. SYSTEM	+	+		+	+2 MILLION PER ANNUM; UPPER BOUND	220 MILLION 'FIRST YEAR' REGISTRANTS NEW AGENCY LIKELY
CHANGE IN STATE LICENSING	-	-		-	EFFECTS NEGLIGIBLE	
INTERSTATE I.D. INDEX	-		-		5 TO 10% REDUCTION IN CRIMINAL SUBMISSIONS	



FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY

DRIVERS AND EFFECTS (Cont'd)

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TYPE OF DRIVER	DIRECTION OF INDUCED CHANGE IN WORK LOAD				UPPER (LOWER) BOUND OF EFFECTS	COMMENTS
	RECORD KEEPING	F.P. SEARCH	CRIMINAL SUBMISSIONS	APPLICANT SUBMISSIONS		
POSSIBLE EVENTS						
CIVIL DISORDER, TERRORISM	+	+	+	+	NOT ESTIMATED	SEE TEXT
OUTBREAK OF WAR	+	+	+	+	+5 MILLION TOTAL; +0.3 MILLION IN A MILITARY DRAFT; UPPER BOUND	
TECHNOLOGICAL TRENDS						
NEW NON-FINGERPRINT I.D. TECHNOLOGIES		-			+2 MILLION; UPPER BOUND	
ELECTRONIC "MAIL"	+	+	+	+	NOT ESTIMATED	TO BE ESTIMATED IN 2ND PHASE STUDY
IMPROVED INFORMATION SYSTEMS	+	+	+	+	NOT ESTIMATED	TO BE ESTIMATED IN 2ND PHASE STUDY
OTHER						
1984 OLYMPICS	+			+	+25,000 NAME CHECKS; UPPER BOUND	



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

SCENARIOS

SCENARIOS LEADING TO INCREASED WORK LOAD

#1 INCREASE IN SUBMISSIONS FROM STATES

- a. STATE SUBMISSIONS REACH 1970 VOLUME AND REMAIN CONSTANT
- b. STATE SUBMISSIONS CONTINUE TO GROW AT PRESENT RATE INDEFINITELY

#2 CRIMINAL SUBMISSIONS INCREASE AT 1.4% PER ANNUM

#3 INCREASE FROM INSTALLATION OF NEW TECHNICAL CAPABILITY

- a. FULL FINGERPRINT SEARCH ON ALL SUBMISSIONS
- b. IMMEDIATE (4-8 HOUR) RESPONSE TO INQUIRIES INCREASES STATE CRIMINAL SUBMISSIONS

SCENARIO INDICATING NO CHANGE

#4 PRESENT DISTRIBUTION AND VOLUME OF WORK LOAD REMAINS CONSTANT

SCENARIO LEADING TO DECREASED WORK LOAD

#5 DEVELOPMENT OF INTERSTATE IDENTIFICATION INDEX REMOVES RECORD KEEPING FUNCTION FOR PARTICIPATING STATES



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

SCENARIO SOURCES AND DRIVING EFFECTS

ORIGIN OF SCENARIO	INCREASE	DECREASE	NO CHANGE
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HISTORICAL

#1 + #2

**FEDERAL
POLICY**

NO SCENARIOS, WILL NOT BE A DRIVER

**PROJECTION
OF USERS**

#4

#5

JUDICIAL

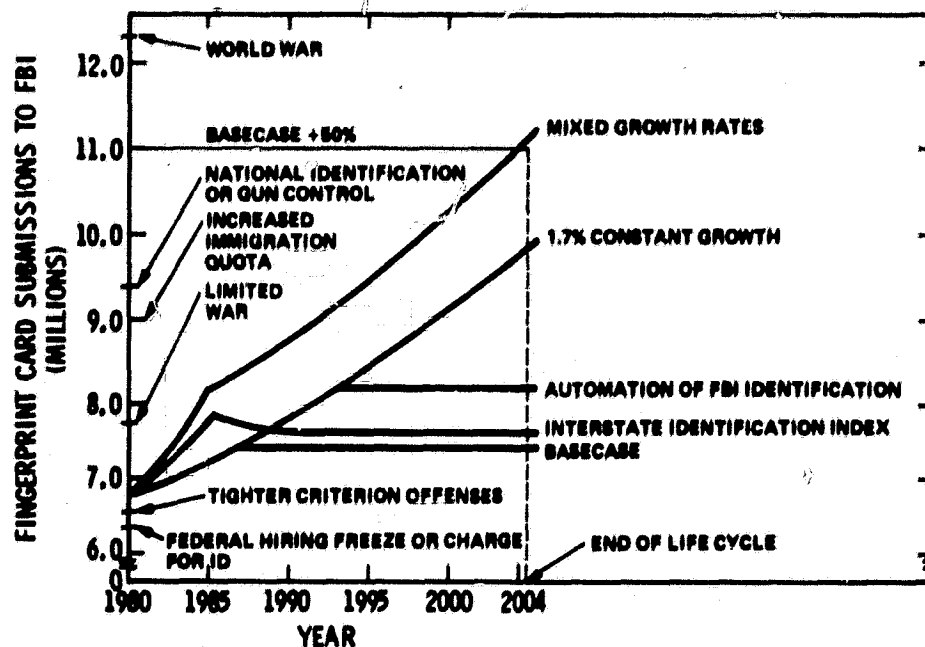
NO SCENARIOS, WILL NOT BE A DRIVER

TECHNOLOGICAL

#3



FBI FINGERPRINT IDENTIFICATION AUTOMATION STUDY RELATION OF DRIVERS TO WORK LOAD PROJECTION



FBI FINGERPRINT IDENTIFICATION AUTOMATION STUDY GROWTH RATES USED TO PROJECT WORK LOAD

SCENARIO	APPLICANT SUBMISSION RATE	PERIOD	CRIMINAL SUBMISSION RATE	PERIOD
BASE CASE, SCENARIO #4	1.7%	1980 - 1986	1.7%	1980 - 1986
	0.0%	1987 - 2004	0.0%	1987 - 2004
1.7% CONSTANT GROWTH, EXTENSION OF GUIDELINE	1.7%	1980 - 2004	1.7%	1980 - 2004
MIXED GROWTH RATES, SCENARIO #1 & #2	6.5%	1980 - 1985	1.4%	1980 - 2004
	2.0%	1986 - 2004		
INTERSTATE IDENTI- FICATION INDEX, SCENARIO #1 & #5	6.5%	1980 - 1985	- 0.85%	1980 - 1992
	0.0%	1986 - 2004	0.0%	1993 - 2004
AUTOMATION OF FBI IDENTIFICATION, SCENARIO #3	2.87%	1980 - 1992	0.35%	1980 - 1992
	0.0%	1993 - 2004	0.0%	1993 - 2004



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
CONCLUSIONS ABOUT INTERNAL ENVIRONMENT**

ENVIRONMENT OF ID IS COMPLEX:

- DIFFERENCES IN USES BY FEDERAL, STATE AND LOCAL AGENCIES
- DIFFERENCES IN REPORTING AND RECORD KEEPING PRACTICES IN USER AGENCIES
- CONTROLS OF INPUTS AND POLICY DISPARATE AND VARIABLE



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY
CONCLUSIONS ABOUT INTERNAL ENVIRONMENT (Cont'd)**

EFFECTS OF DRIVERS/SCENARIOS LIE WITHIN GUIDELINES:

- RESULTS OF PRESENT TRENDS APPROACHING STEADY STATE - IMPLY LITTLE CHANGE IN VOLUME OR DISTRIBUTION OF WORK LOAD
- CHANGES RESULTING FROM PROJECTED EVENTS HAVE MINIMAL EFFECTS
- EVENTS WITH LARGE EFFECTS ARE JUDGED UNLIKELY
- INTRODUCTION OF NEW TECHNOLOGIES AFFECTING WORK LOAD LIE OUTSIDE TIME FRAME OF STUDY



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

STATUS OF EXTERNAL MODEL

● **PRINCIPAL ACTORS IN THE EXTERNAL ENVIRONMENT ARE:**

- **FBI IDENTIFICATION DIVISION**
- **AGENCIES OF FEDERAL GOVERNMENT**
- **AGENCIES OF STATE GOVERNMENTS AND OF LOCAL LAW ENFORCEMENT**

● **COMPETITION BETWEEN THE FEDERAL AND STATE AND LOCAL AGENCIES**

- **FOR CONTROL OF THE TWO IDENTIFICATION FUNCTIONS**
- **CRIMINAL HISTORY RECORD KEEPING**
- **APPLICANT IDENTIFICATION**

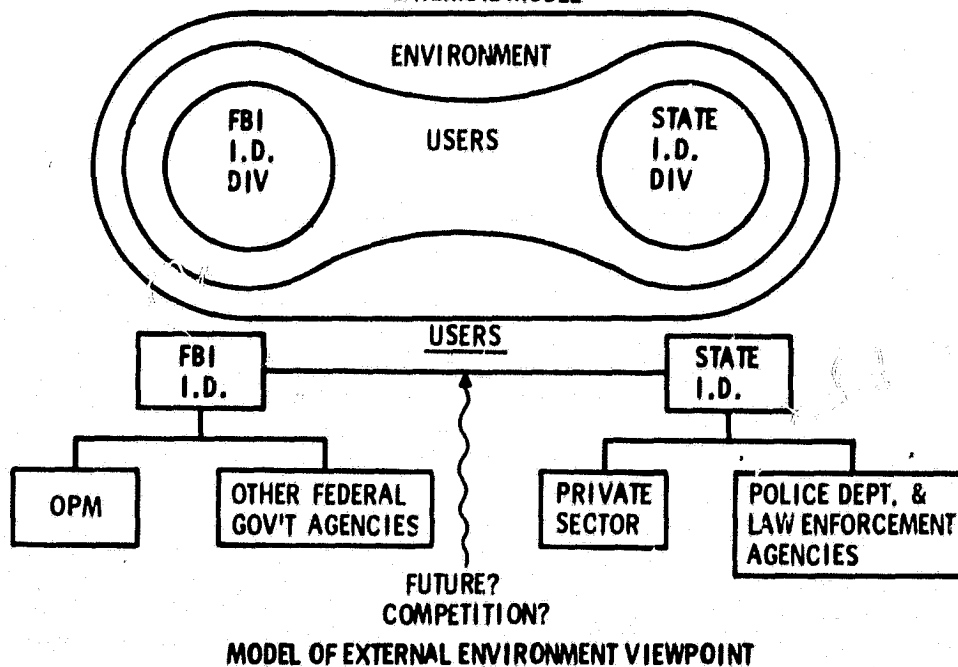
● **STATES WILL NOT GIVE UP CONTROL TO FEDERAL AGENCIES BECAUSE:**

- **A. POLITICAL/LEGAL**
RECORD KEEPING OF CRIMINAL HISTORIES IS CONSIDERED BY THE STATES TO BE THEIR BUSINESS
- **B. MANAGERIAL/TECHNICAL**
MORE ACCURATE AND TIMELY RECORD KEEPING CAN BE DONE BY THE STATES



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

**DIAGRAM OF EXTERNAL MODEL
I.D. AND RECORD KEEPING ENVIRONMENT
EXTERNAL MODEL**





**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

STATEMENT OF EXTERNAL MODEL PROBLEMS

DISSATISFACTION WAS EXPRESSED BY EXTERNAL AGENCIES ABOUT:

- SLOWNESS OF RESPONSE TIME
- ACCURACY AND COMPLETENESS OF DISPOSITION INFORMATION

CONFLICTING IDEAS EXIST ABOUT:

- ADEQUACY OF PRIVACY SAFEGUARDS
- LOCUS OF CONTROL
- WHETHER OR NOT IDENTIFICATION AND CRIMINAL HISTORY RECORD KEEPING SHOULD BE SEPARATED
- AMOUNT AND TYPE OF REPORTING TO THE I.D. REQUIRED OF THE STATES
- AMOUNT OF SERVICE REQUIRED OF THE I.D. TO THE STATES AND LOCAL
- LOCAL LAW ENFORCEMENT AGENCIES

RESOURCES AVAILABLE TO AGENCIES WHICH ARE DRIVING FACTORS ON POTENTIAL WORK LOAD ARE:

- MONEY FOR PURCHASE OF TECHNOLOGY
- LEGISLATIVE/REGULATORY POWERS



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

WORKING HYPOTHESES ABOUT EXTERNAL ENVIRONMENT

- ACTIVITIES OF THE I.D. CAN BE CONTROLLED THROUGH EXPENDITURES FOR TECHNOLOGY INSTEAD OF THROUGH LEGISLATIVE/REGULATORY RESTRICTIONS
- FEDERAL INFLUENCE WILL BE MONETARY; STATE'S INFLUENCE WILL BE LEGISLATIVE/REGULATORY
- OUTCOMES OF COMPETITION BETWEEN STATE AND FEDERAL AGENCIES WILL REVEAL FUTURE CHANGES IN INTERNAL I.D. ENVIRONMENT WHICH CAN BE PROJECTED AS DRIVERS AND SCENARIOS
- PROJECTIONS OF DRIVERS AND SCENARIOS WILL REVEAL TRENDS IN WORK LOAD

• PROJECTIONS:

• A. LONG-TERM SCENARIO

THERE WILL BE A CLEAR DIVISION AND NO DUPLICATION OF LABOR BETWEEN FEDERAL AND STATE AGENCIES

• B. INTERMEDIATE SCENARIO

- THERE WILL BE OVERLAP AND DUPLICATION OF FUNCTIONS

• CONCLUSIONS:

- WILL CONTINUE TO BE OVERLAP OF FUNCTIONS BETWEEN THE STATE AND FEDERAL AGENCIES IN 1993



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

POLICY MAKING IN EXTERNAL AGENCIES AS DRIVERS OF CHANGE

LOC OF CONTROL

● FEDERAL LEVEL

- JUDICIARY
- CONGRESSIONAL
- EXECUTIVE

● STATE LEVEL

- JUDICIARY
- LEGISLATIVE
- EXECUTIVE



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

SCOPE OF CONCERNS BY SECTOR

FEDERAL AND STATE JUDICIARY

● ADVERSARY PROCESS REQUIRES:

- PRESENCE OF AN ISSUE RAISED BY AN INDIVIDUAL
- DIFFICULT TO PREDICT WHICH ISSUES WILL BE LITIGATED
- DIFFICULT TO PREDICT HOW ISSUES WILL BE FORMULATED

- JUDICIARY HAS CONTROL ONLY OVER RESOLUTION – NOT OVER WHICH ISSUES ARE RAISED



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

SCOPE OF CONCERNS BY SECTOR (Cont'd)

EXECUTIVE

- LEAA - OUT OF BUSINESS
- OMB - WILL ONLY RESPOND TO BUDGET PROPOSALS
- IDENTIFICATION DIVISION -
 - COULD USE ABILITY TO REGULATE LICENSING AND APPLICANT CHECKS TO CENTRAL WORK LOAD
 - COULD USE ELECTRONIC COMMUNICATIONS AND IMAGE TRANSFER TO SHORTEN RESPONSE TIME TO A POINT WHERE USE PATTERNS WOULD CHANGE
 - END-TO-END RESPONSE TIME OF 8 TO 48 HOURS
 - COULD RETURN RECORD KEEPING TO THE STATES
- NO INDICATION FROM IDENTIFICATION DIVISION THAT THEY PLAN OR WISH TO IMPLEMENT ANY OF THE ABOVE



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

SCOPE OF CONCERNS BY SECTOR (Cont'd)

JUSTICE DEPARTMENT

- MOST LIKELY SOURCE OF CHANGE
 - CHANGE, IF IT IS TO OCCUR, WILL HAVE TO ARISE AT EXECUTIVE LEVELS
 - OTHER AGENCIES ARE EXPECTING JUSTICE DEPARTMENT TO TAKE THE INITIATIVE
 - III - INTERSTATE IDENTIFICATION INDEX - A POINTER SYSTEM WHICH DIRECTS INQUIRIES TO STATE WHERE RECORDS ARE KEPT. THIS PLAN IS IN THE PILOT STAGE.



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

SCOPE OF CONCERNS BY SECTOR (Cont'd)

STATE EXECUTIVE AND LEGISLATIVE

- STATE POLICY ON IDENTIFICATION IS RESPONSIVE TO PRESSURES FROM TRENDS WITHIN STATES AND TO FISCAL AND POLICY CONTROLS IMPOSED BY FEDERAL AGENCIES
- DISSATISFACTION WITH ASPECTS OF IDENTIFICATION DIVISION SERVICES AT STATE AND LOCAL LEVELS IS NOT LIKELY TO LEAD TO POLICY INITIATIVES



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

SCOPE OF CONCERNS BY SECTOR (Cont'd)

CONGRESS

- FBI OVERSIGHT -
- NO PRESSURE FOR CHANGE ORIGINATING HERE
- LACK OF TIME AND TECHNICAL SKILL TO ASSESS TECHNICAL FACTORS
- LACK OF TIME FOR DETAILED BUDGET REVIEW
- ACTION LIMITED TO RESPONSE TO ADMINISTRATIVE ACTION BY THE JUSTICE DEPARTMENT



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

SCOPE OF CONCERNS BY SECTOR (Cont'd)

CONGRESS (CONTINUED)

- **REVISION OF FBI CHARTER**
 - **FOCUS ON LIMITS TO FBI ACTIVITIES**
 - **EXPRESSED CONCERNS**
 - **THE ABILITY OF THE FBI TO KEEP ACCURATE RECORDS**
 - **THE ABILITY OF THE FBI TO CONTROL INFORMATION ONCE IT IS DISSEMINATED**



**FBI FINGERPRINT IDENTIFICATION
AUTOMATION STUDY**

CONCLUSIONS ABOUT EXTERNAL ENVIRONMENT

- **FEDERAL AND STATE AGENCIES EXTERNAL TO THE FBI ARE CAPABLE OF INITIATING CHANGES THAT WILL AFFECT THE DIVISIONAL WORK LOAD THROUGH THE USE OF FISCAL AND POLICY CONTROLS**
- **NO STRONG DIRECT PRESSURES ARE APPARENT THAT WOULD LEAD TO CHANGES INITIATED BY EXTERNAL FEDERAL AND STATE AGENCIES, WITH THE EXCEPTION OF III**

APPENDIX C

ACRONYMS

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APPENDIX C

ACRONYMS

ACS	Automated Classification System
AFRS	Automated Fingerprint Reader System
AHU	Anti-Halation Underlayer
AIDS	Automated Identification Division System
ANS	Automated Name Search
ATS	Automated Technical Search
ATSPS	Automated Technical Search Pilot System
AUTOCOR	Automated Correspondence Station (part of AIDS)
AUTORESP	Automated Response Generation (part of AIDS)
A&R	Automation and Research Section of Identification Division
BER	Bit Error Rates
BLO	Blocking Out
CCA	Computerized Contributor Abbreviated Name
CCH	Computerized Criminal History (part of NCIC)
CCN	Computerized Criminal Name
CCNR	Computerized Criminal Name and Record (part of AIDS)
CCR	Computerized Criminal (Arrest) Record (part of AIDS)
CIR	Computerized Ident Response File (part of AIDS)
CLASS-A	Classification-A
CLASS-B	Classification-B
CLASS-C	Classification-C
CLICK	Classification Check
CNR	Computerized Non-Ident Response File
COA	Cutoff Age
CPU	Central Processing Unit

CRS	Computerized Record Sent File (part of AIDS)
CRT	Cathode Ray Tube
CSORT	Centerline Sort
DATE STP	Date Stamp, Count and Log
DBMS	Data Base Management System
DEDS	Data Entry and Display Subsystem (part of AIDS III)
DENT	Data Entry
DENT-A	Data Entry-Cards
DENT-B	Data Entry-Documents
DOA	Date of Arrest (on f/p card)
DOB	Date of Birth (on f/p card)
ECL	Emitter Coupled Logic
EMI	Electromagnetic Interference
ENC	Encode Input Data-Cards
ENCDOC	Encode Input Data-Documents
ENCK	Encode Check-Cards
ENDOCK	Encode Check-Documents
ERR	Update Error File
EYE	Color of Eyes (on f/p card)
FBI	Federal Bureau of Investigation
FEP	Front End Processor
FIFO	First-In-First-Out
FLAB	Film Lab Processing/Computer
FLOAD	Film Load
FPC	Fingerprint Classification
FPCS	Fingerprint Correspondence Section of the Identification Division
f/p	Fingerprint

GDBMS	General Purpose Data Base Management System
GEO	Geographic Location (on f/p card)
GPSS	General Purpose Simulation System
HAI	Color of Hair (on f/p card)
HGT	Height (on f/p card)
IBM	International Business Machines Corporation
ICI	Image Comparison Identification
ICRQ	Image Comparison Request
ICS	Image Comparison Subsystem (part of AIDS III, actually used for image retrieval for manual comparison)
ICV	Image Comparison Verification
ID, I.D.	Identification Division
IDENT	Identification
JPL	Jet Propulsion Laboratory
KIPS	Thousands of Instructions per Second (as executed by a computer)
LEAA	Law Enforcement Assistance Agency
MAIL	Open Mail and Sort
MFILM	Image Capture Microfilm
MIPS	Millions of Instructions per Second (as executed by a computer)
MMF	Minutiae Master File
MOE	Measures of Effectiveness
MTBF	Mean Time Between Failures
MTR	Master Transaction Record
MTTR	Mean Time to Repair
NAM	Name (on f/p card)
NASA	National Aeronautics and Space Administration
NCIC	National Crime Information Center

NCR	National Cash Register Company
OCA	Local Identification Number (on f/p card)
OCR	Optical Character Recognition
OMB	Office of Management and Budget
ORI	Originating Agency Identification Number (on f/p card)
PCN	Process Control Number
PICS	PCN and Image Capture Subsystem (part of AIDS III)
PMT	Photomultiplier Tubes
POB	Place of Birth (on f/p card)
QC	Quality Control
QUERY	On-Line Query
RAC	Race (on f/p card)
READ	Quality Control Check, Read, Annotate
RFI	Radio Frequency Interference
RH	Relative Humidity
RVF	Ridge Valley Filter
SACS	Semi-Automatic Classification System
SAR	Semi-Automatic Fingerprint Reader
SEAR	Search Review
SEX	Reported Sex of a Subject (on f/p card)
SID	State Identification Number
SKN	Skin Tone (on f/p card)
SOC	Social Security Number (on f/p card)
SPM	Search Processor Module
SS	System Supervisor Subsystem (part of AIDS III)
SSM	Subject Search Module
SSRG	Subject Search and Response Generation Subsystem (part of AIDS III)

TDFA	Top Down Functional Analysis
TFC	Technical File Conversion
TR	Transaction Record
TRC	Transaction Control File
TSS	Technical Search Subsystem (part of AIDS III)
TTL	Transistor - Transistor Logic
VDENT-A	Verify Data Entry-Cards
VDENT-B	Verify Data Entry-Documents
VLSI	Very Large Scale Integration
WAND	Wand Out of System